ME-7624

RESERVE

INSTRUCTION MANUAL

EMR 4530 DUAL
VOLTAGE-CONTROLLED OSCILLATOR
(REVISION B)

SANGAMO WESTON
Schlumberger
EMR TELEMETRY

ME-7624

c.1

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July, 1970

MANUAL CHANGE NOTICE #1

EFFECTIVITY: Model 4530, serial numbers 81 and up.

DESCRIPTION: Capacitors C1 and C2 shown in drawings 15800, 16131, and 16130 (pages 5-22, 5-23, and 5-24) are changed. Component values and types are listed on the Calibrate Card parts lists in Section 6.

July, 1970

MANUAL CHANGE NOTICE #2

EFFECTIVITY: Model 4530, serial numbers 88 and up.

DESCRIPTION: Resistors R10 and R96 shown in drawing 15794 on page 5-26 are changed to test variables. See parts list, Section 6, for value range and type.

LIST OF EFFECTIVE PAGES

Dates of issue for basic and revisions are:

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*Title	B
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2-1 thru 2-4	Basic
3-1 thru 3-6	Basic
4-1 thru 4-7	Basic
5-1 thru 5-24	Basic
*5-25	B
5-26	Basic
*5-27	B
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*6-19 and 6-20	B
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*6-22 and 6-23	B
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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual contains information describing the EMR 4530 Dual Voltage-Controlled Oscillator. Included in this information are functional and physical descriptions, system application, specifications, installation and operation instructions, theory of operation, maintenance data, and replaceable and spare parts list. Several configurations of the 4530 are available for particular applications. The various configurations are outlined in the model number identification in Table 2-1.

1.2 FUNCTIONAL DESCRIPTION

The 4530 is a precision solid-state unit designed for use as a subcarrier link between data source devices and data reduction or recording instruments. Included in the 4530 are two voltage-controlled oscillators (VCO's) which are completely independent in operation. Each VCO operates at a particular subcarrier channel center frequency and deviation. These parameters are established by plug-in VCO card assemblies. Center frequency and deviation parameters of each VCO are identified on the front panel.

The 4530 is available for use in constant bandwidth or proportional bandwidth FM telemetry systems. Built-in calibration facilities, under local or remote control, are available in the 4530. These facilities are described in Table 2-1 and in Section 3 of this manual.

Regulated power for operation of the 4530 is provided by an internal power supply and regulator. The power supply and regulator is available for operation from various primary power sources. These are identified in Table 2-1. Also, the 4530 may be supplied without a power supply and regulator. In this configuration, the regulated power is supplied by an EMR 4023 Power Supply which is designed to provide operating power to several of EMR's 4000-Series modular units mounted in close proximity.

A simplified block diagram of the 4530 is shown in Figure 1-1. The VCO's in the 4530 operate from single-ended data sources to provide frequency modulated subcarrier outputs. Separate inputs and outputs are provided for each VCO. Data inputs are routed from the rear connector to the calibrate card. Circuits on this card vary depending on the particular 4530. Certain units contain calibration relays which interrupt the data inputs and provide calibration voltages to the VCO's. Internal or remote calibration commands control the calibrate relays. Calibration voltages are derived from internal or external voltage sources again depending on the particular unit.

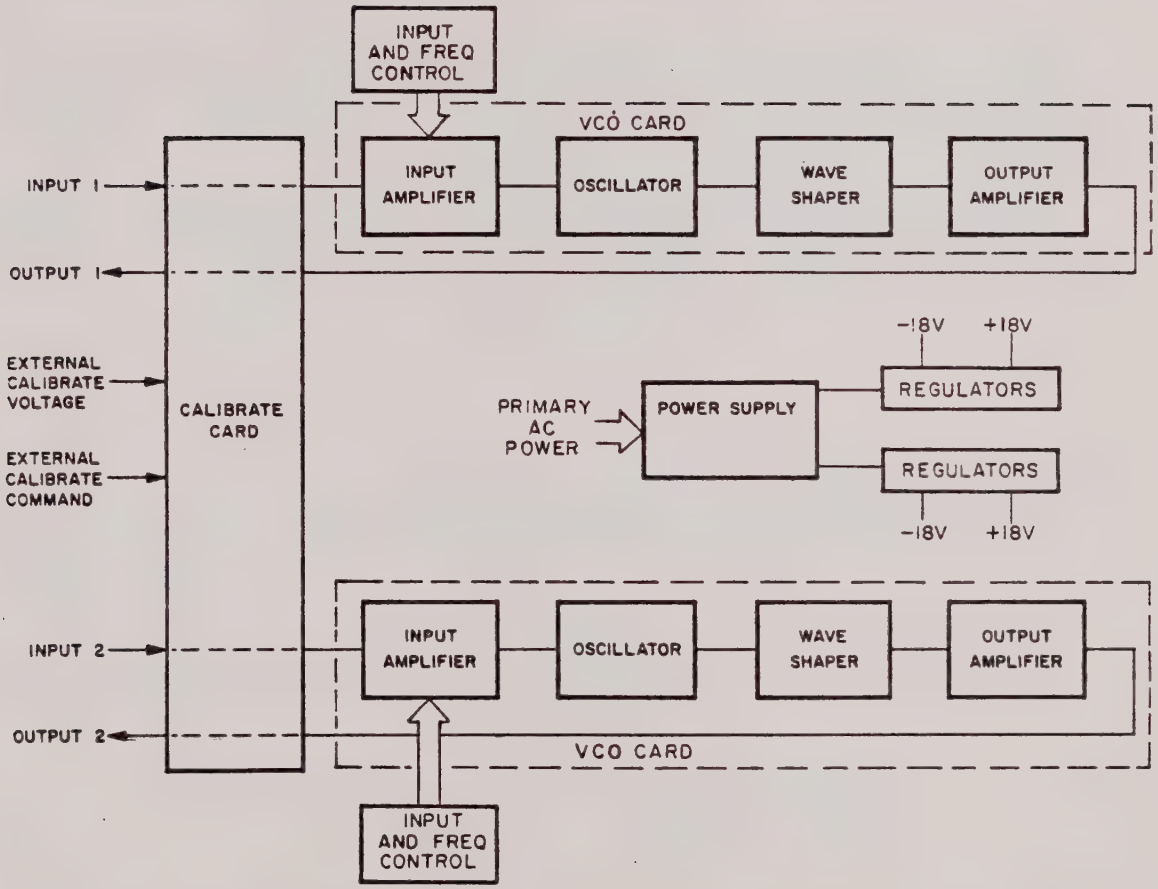


Figure 1-1. EMR 4530 Simplified Block Diagram

Quiescent conditions for the VCO's are established in the input amplifier circuit on the VCO card. Data signals up to 10-volts peak-to-peak are accommodated and any data signal up to this limit can be used to deviate the VCO from bandedge-to-bandedge. The input level adjustment in the input amplifiers is performed at the INPUT controls. The input amplifiers may be offset such that the signal outputs to the oscillators are at levels necessary to offset the oscillator frequencies to a bandedge of the selected subcarrier channel. This adjustment is performed at the FREQ controls.

The oscillators are triangular wave generators which operate at the nominal frequency of the selected subcarrier channel. Subcarrier frequencies within the subcarrier channel are controlled by an input voltage from the input amplifier.

Waveshaper circuits provide cornering to convert the triangular wave signals to sine wave subcarrier signals. The waveshaper outputs are coupled through OUTPUT level controls and output amplifier circuits to the 4530 outputs. The OUTPUT level controls provide continuous adjustment of the subcarrier outputs from 0.2 volt RMS to not less than 2 volts RMS (open circuit).

1.3 PHYSICAL DESCRIPTION

The 4530 is a modular unit designed for mounting in an EMR 4005 Rack Adapter. One modular width of the rack adapter is required for mounting the 4530. (Refer to the EMR 4005 Rack Adapter Instruction Manual for information describing the rack adapter.)

The 4530 consists of five major subassemblies. These subassemblies are shown on the top assembly drawing 14991 in Section 5 of this manual. The five major subassemblies are listed as follows:

Chassis Assembly	--	Item 1 on drawing 14991; shown independently in drawing 14992 of Section 5.
Front Panel Assembly	--	Item 2 on drawing 14991; shown independently in drawing 14990 of Section 5.
Regulator Card Assembly	--	Item 6 on drawing 14991; shown independently in drawing 15799 of Section 5.

Calibrate Card Assembly -- Item 7 on drawing 14991; shown independently in drawing 15906 of Section 5.

VCO Card Assemblies -- Item 8 on drawing 14991; shown independently in drawing 15796 of Section 5.

Although several configurations of the 4530 are available, all units are generally the same in physical layout. All units except the 4530-9X series contain a complete complement of subassemblies as listed above. The 4530-9X series does not have an internal power supply; therefore, the power supply components and regulator card are not included. The remaining 4530 configurations differ only in the type of calibration facilities included. The various calibration facilities are provided by including wiring in the unit and adding components to the calibration card.

1.4 SYSTEM APPLICATION

A typical system in which the 4530 may be used is shown in Figure 1-2. This diagram also illustrates other EMR equipments available which may be used in conjunction with the 4530.

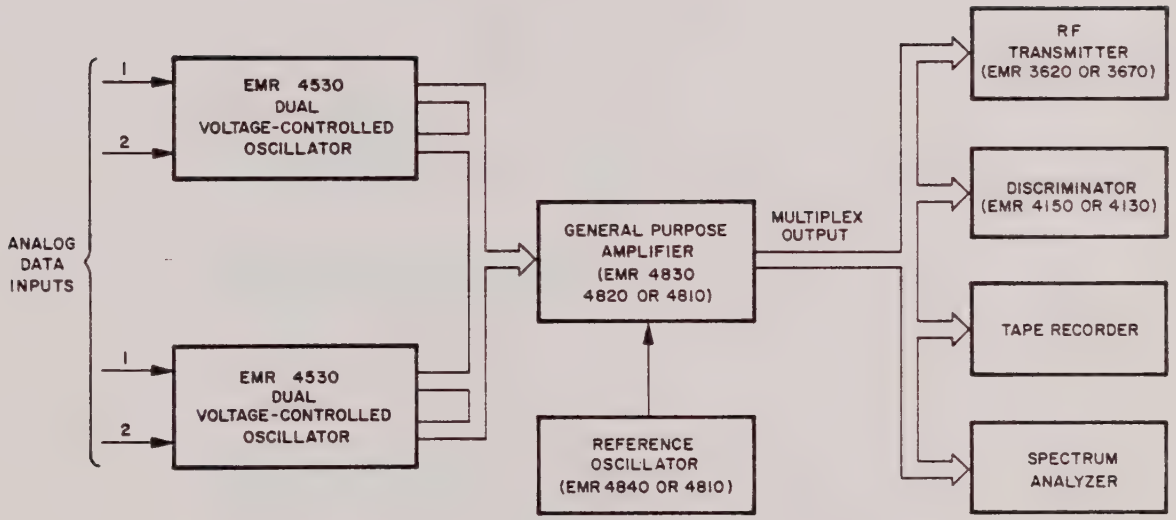


Figure 1-2. Typical System Application

SECTION 2

SPECIFICATIONS

2.1 GENERAL

This section contains the electrical, mechanical, and environmental specifications for the EMR 4530. Also included is a model number identification table (Table 2-1) which contains the complete model number of the unit and a description of each digit in the model number.

2.2 ELECTRICAL SPECIFICATIONS

2.2.1 Input Characteristics

a. Input Impedance: Not less than 100K ohms shunted by not more than 100 Pf.

b. Input Signal Amplitude Range: 1.0 to 10.0 volts peak-to-peak for full bandwidth deviation. Adjustable with front panel control.

c. Deviation Polarity: Positive.

d. Deviation Limiting: With input levels of up to 500% of full-scale input, frequency deviation is limited to not more than 15% of full bandwidth beyond bandedge.

e. DC Offset: Continuously variable from high-to-low bandedge.

2.2.2 Output Characteristics

a. Center Frequency: Proportional or constant bandwidth channels with center frequencies of 300 Hz through 1.5 MHz.

b. Deviations: ±2% through ±40%.

c. Center Frequency Stability: Center frequency drift is not more than ±0.05% of center frequency for 15 hours at a constant temperature (±3°C) after a 15-minute warm-up. Zero-input frequency will drift no more than ±0.01% per °C average over the ambient temperature range of +10°C to +50°C.

d. Bandwidth Stability: Bandwidth drift is not more than ±0.20% of full-scale deviation for 15 hours at a constant temperature (±3°C) after a 15-minute warm-up. With an ambient temperature of +10°C to +50°C, bandwidth drift is no more than ±0.025% per °C average.

e. Static Linearity: Best straight line non-linearity is not more than ±0.1% of bandwidth.

f. Intelligence Response: For frequencies corresponding to a modulation index of 2 or more, the change in intelligence response is not more than ±0.5 Db from DC up to 100 KHz. At 500 KHz, the intelligence response is down by not more than 3 Db from that measured at DC.

g. Intelligence Distortion: In a system with a deviation ratio of 5, the intelligence distortion is not more than 0.5% at any frequency up to cutoff.

h. Overload Recovery: For a 500% overload of any duration and at any sensitivity, the output frequency returns to within ±0.1% of final value in not more than 5 microseconds or one carrier cycle period, whichever is greater.

i. Amplitude Modulation: Amplitude modulation of the sine wave output for any deviation is not more than 0.5 Db.

j. Subcarrier Distortion: At any deviation, the harmonic distortion of the subcarrier output is not more than 1% for individual harmonics not more than 1.5 MHz.

k. Sine Wave Output: Continuously adjustable at the front panel from 0.2 volt RMS to not less than 2 volts RMS open circuit.

l. Line Voltage Sensitivity: A 10-volt change in line voltage within the operating range of 105 to 132 volts causes a change in center frequency of not more than ±0.02%, and a change in bandwidth of not more than ±0.1%.

m. Output Noise: FM noise output is not more than 0.1% of full bandwidth RMS as measured in a deviation-ratio-of-5 system.

n. Output Impedance: Standard output impedance is 220 ohms ±10% for direct resistive mixing. An internal jumper may be added to change the impedance to 50 ohms ±10%.

2.2.3 Power Requirement

The input power requirements are listed in Table 2-1. The unit is fused from the AC power input with a 1 amp fuse for 120-volt operation and with a 500 milliamp fuse for 220-volt operation.

2.2.4 Calibration Provision

The various calibration provisions are described in Table 2-1. Internal calibration voltages are within ±0.2% of full-scale voltages specified in Table 2-1.

2.3 MECHANICAL SPECIFICATIONS

a. Height: 5-1/4 inches (13.3 Cm).

b. Width: 1.22 inches (3.10 Cm).

c. Depth: 16.75 inches, excluding front panel projections.

d. Weight: Net, 3-1/8 pounds (1.42 Kg); shipping, 5 pounds (2.27 Kg).

e. Panel Finish: Several paint colors are available as listed in Table 2-1.

f. Mounting: The unit is designed for mounting in an EMR 4005 Rack Adapter. The rack adapter occupies 5-1/4 inches by 19 inches (13.3 Cm by 48.2 Cm) in a standard equipment rack.

2.4 ENVIRONMENTAL SPECIFICATIONS

a. Temperature: Operating, +10°C to +50°C; storage, -55°C to +85°C.

b. Altitude: 0 to 50,000 feet.

c. Relative Humidity: 5% to 95%.

d. Vibration: Non-operating, per MIL-STD-810A, method 514, equipment class 6, Figure 514-6, curve A.

e. Shock: Non-operating, per MIL-STD-810A, method 516, procedure III.

Table 2-1. EMR 4530 Model Number Identification

4530 - a: XX - b: XXXX.XXX - c: XXX.XX - d: XXXX.XXX - e: XXX.XX - f: XX.XX - g: XX.XX - h: XX	
a.	First Digit: Input power identification. 0 -- 105 to 132 volts RMS, 47 to 65 Hz. 7 -- 105 to 132 volts RMS, 360 to 440 Hz. 8 -- 230 volts RMS ±10%, 47 to 63 Hz. 9 -- No power supply included, requires ±18 volts supplied by external supply, such as an EMR 4023 Power Supply. Second Digit: Oscillator Configuration. 1 -- No calibration. 2 -- External calibration source, remote control. 3 -- Internal calibration source, remote control. 4 -- Internal calibration source, local control.
b.	VCO 1 center frequency in 7-digit KHz.
c.	VCO 1 peak deviation in 5-digit % for PBW subcarrier channels or 5-digit KHz for CBW subcarrier channels.
d.	VCO 2 center frequency in 7-digit KHz.
e.	VCO 2 peak deviation (same as VCO 1).
f.	Negative Calibrate Voltage: For 4530-X3 and X4, negative calibrate voltage in 4-digit volts.
g.	Positive Calibrate Voltage: For 4530-X3 and X4, positive calibrate voltage in 4-digit volts.
h.	Panel Paint Code: 01 -- Light green 00048W 02 -- Dark green 00049W 04 -- Gray 26492B 99 -- Special

SECTION 3

INSTALLATION AND OPERATION

3.1 INSTALLATION

The EMR Model 4530 Dual Voltage-Controlled Oscillator is shipped completely assembled and is ready for mounting. The unit should be inspected immediately on its arrival and notice given to EMR-Telemetry of any claim that the product does not conform with the terms of the order.

The Model 4530 is a modular unit designed for mounting in an EMR Model 4005 Rack Adapter. The modular unit is positioned on T-rails on the bottom surface of the rack adapter interior and is inserted into the mounting location. A push-to-lock knob on the front panel is depressed securing the unit in the mounting location of the rack adapter. The unit rear connector J1 mates with a receptacle in the rack adapter interior completing the electrical connections.

Information illustrating the position of the unit in the rack adapter and internal wiring of the rack adapter is contained in the EMR Model 4005 Rack Adapter Instruction Manual. The Model 4530 rear connector J1 and the external connections terminated at J1 are illustrated in Figure 3-1.

Internal cooling for the Model 4530 is provided by a blower mounted vertically on the rack adapter rear panel.

3.2 OPERATION

3.2.1 Operating Controls and Monitor Jacks

The operating controls and monitor jacks used for operation of the Model 4530 are illustrated in Figure 3-2 and described in Table 3-1.

3.2.2 Signal Input Configurations

The 4530 VCO's operate independently from single-ended data sources. For certain 4530 design sequences, two separate inputs (input and input return) to each VCO are provided. The remaining 4530 design sequences contain only one input and a unit common input. However, for both types of units, the data signal input must be applied to the input terminal. The input return and unit common connections are signal ground inputs.

The deviation sense of the VCO's is positive in that a positive voltage applied at the input will yield a frequency increase at the output. A negative voltage applied at the input will yield a frequency decrease at the output.

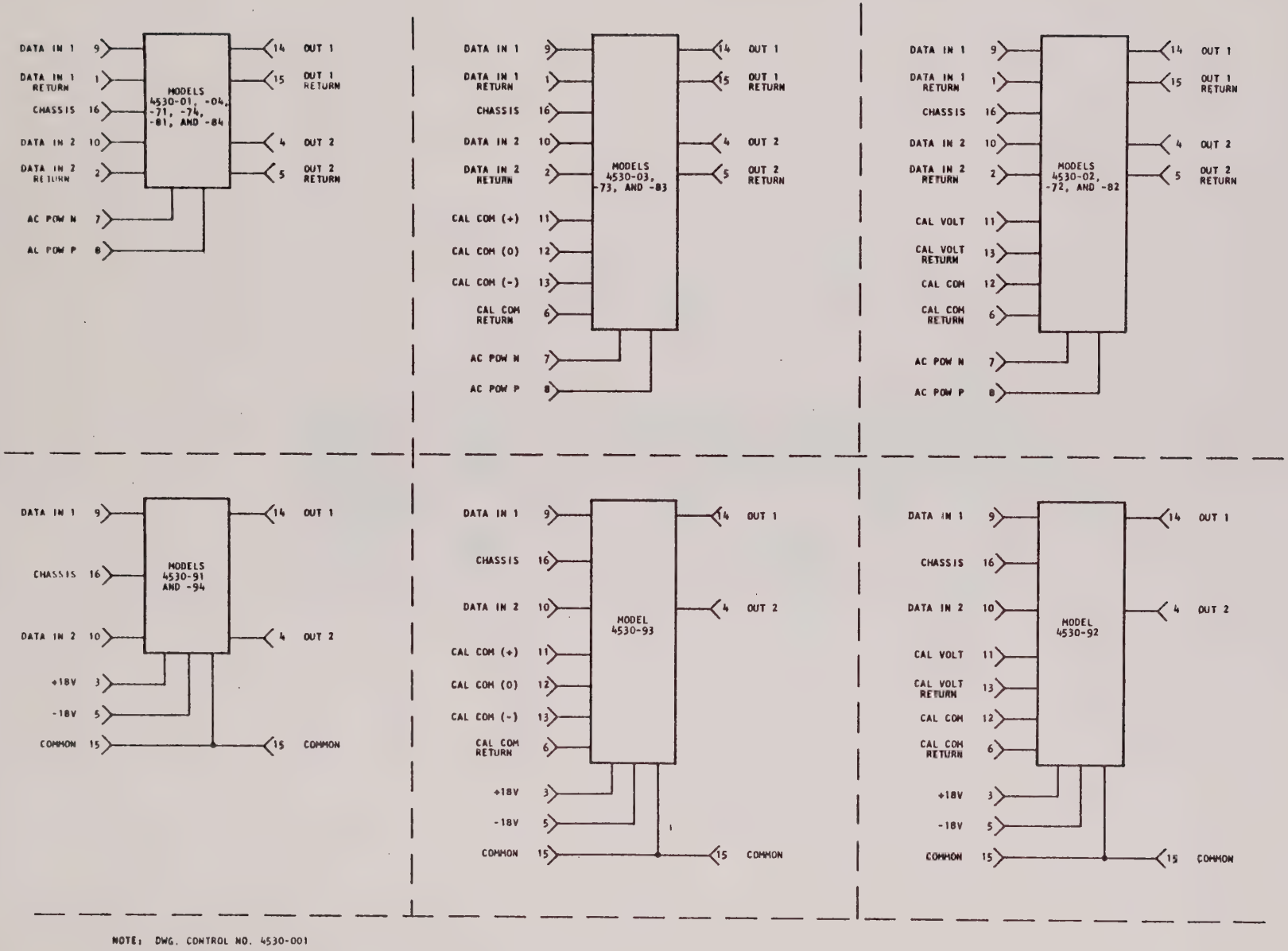


Figure 3-1. EMR 4530 External Electrical Connections

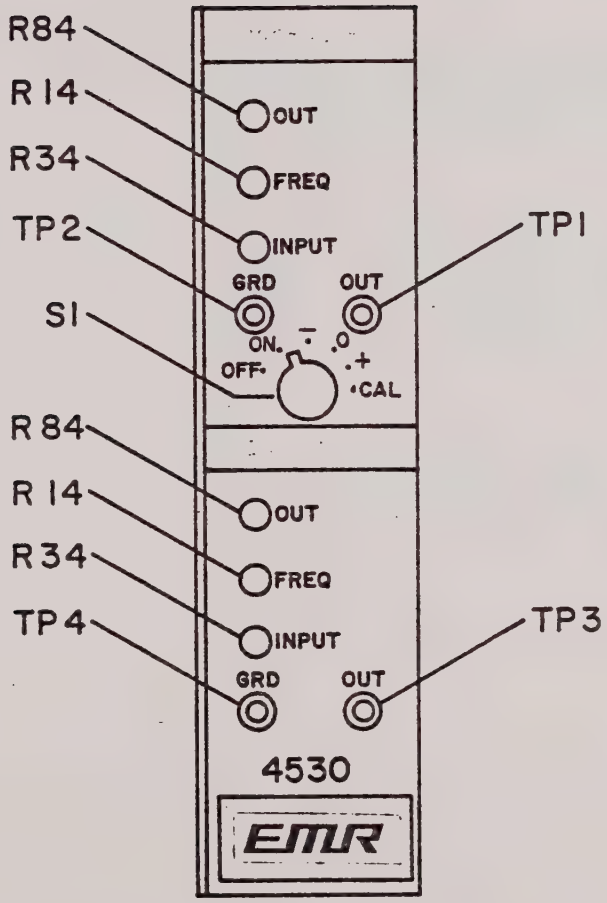


Figure 3-2. EMR 4530 Front Panel Components

Table 3-1. EMR 4530 Function of Front Panel Components
(Ref. Figure 3-2)

DESIG.	NAME	FUNCTION
R84	OUT control	Adjusts the amplitude of the VCO output. The top R84 is for VCO #1 and the bottom R84 is for VCO #2.
R14	FREQ control	Adjusts the VCO frequency. This control permits continuous adjustment of the VCO frequency from LBE to HBE. The top R14 is for VCO #1 and the bottom R14 is for VCO #2.
R34	INPUT control	Adjusts the full-bandwidth deviation voltage input of the VCO up to 10-volts peak-to-peak. The top R34 is for VCO #1 and the bottom R34 is for VCO #2.
TP2	GRD test jack	Output return for VCO #1.
S1	Control switch	Provides OFF/ON control for all 4530's and provides local calibrate selection for the 4530-X4. Calibrate positions are as follows: CAL (-) -- Both VCO's in calibrate mode and negative calibrate voltage input. CAL (0) -- Same as CAL (-) except zero calibrate voltage input. CAL (+) -- Same as CAL (-) except positive calibrate voltage input.
TP4	GRD test jack	Output return for VCO #2.
TP3	OUT test jack	VCO #2 output test jack.
TP1	OUT test jack	VCO #1 output test jack.

3.2.3 Operating Information

In the data mode of operation, the two VCO's in the 4530 operate independently from two separate sources. Separate inputs, outputs, and front panel operating controls are provided for each VCO. In a calibrate mode of operation, the VCO inputs are both switched to operate from a single calibrate input source. The mode of operation is selected either at the front panel or remotely depending upon the particular 4530 design sequence. Various calibration facilities are described in paragraph 3.2.4.

The initial set up of the VCO's is dependent upon the particular application. The following general steps are provided to assist the operator in the set up of the 4530.

a. Positive Data Sources: When the data sources on which the VCO's are to operate are positive, the quiescent VCO frequencies should be offset to a frequency corresponding to low bandedge (LBE). This offset adjustment is performed with the front panel FREQ controls. The positive-going data signal thus drives the VCO frequency to high bandedge (HBE). The expected peak amplitude of the data signal should be determined and the VCO input level set such that this peak data signal will deviate the VCO to full bandwidth. The VCO input level is adjusted with the front panel INPUT controls.

b. Negative Data Sources: Set up is the same as step (a) above except that the quiescent VCO frequencies should be offset to HBE. Thus, the negative data signals drive the VCO frequencies to LBE.

c. Bipolar Data Sources: For bipolar data signal sources, the VCO's are set to operate at center frequency and the bipolar data signals deviate the VCO frequencies to HBE and LBE. The quiescent VCO frequencies are again set using the front panel FREQ controls. The expected peak-to-peak amplitude of the data signal sources are used in determining the INPUT level adjustment.

3.2.4 Calibration Facilities

The 4530 is available in four calibration configurations. These configurations are described as follows:

a. 4530-X1 -- No built in calibration. Initial set up and calibration is performed via the data inputs to the unit by external equipments.

b. 4530-X2 -- Calibration relays are included which are controlled by a remote calibration command to switch the data inputs to the VCO's to a single calibration voltage input. Calibration voltage input must be supplied by an external source. The required calibration voltage is dependent upon the quiescent settings of the VCO's. The remote calibration command voltage required is +24 volts ±6V DC.

c. 4530-X3 -- Calibration relays are included which are controlled by a remote calibration command to switch the data inputs to the VCO's to a single calibration voltage input. The calibration voltage is derived from a built-in voltage divider. This voltage divider provides specified voltages for (−), (0), and (+) calibration selection. The calibration voltages are established by the customer in the ordering information (See Table 2-1). The remote calibration command voltage required is +24 volts ±6 V DC.

d. 4530-X4 -- Same as the 4530-X3 except that the calibrate mode and calibrate selection are performed at the front panel control switch. The calibration voltages are established by the customer in the ordering information (See Table 2-1).

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

This section contains the detailed theory of operation for the EMR 4530. The theory discussion is presented at the card level with reference to schematic diagrams in Section 5 and, where appropriate, to detailed block diagrams in this section. A general description and simplified block diagram of the 4530 are contained in Section 1 of this manual. The user should be thoroughly familiar with the general information in Section 1 before proceeding to this theory discussion.

4.2 CALIBRATE CARD

Four calibrate card configurations are used in the 4530. The particular configuration used is dependent on the design sequence. These four configurations are described in the following paragraphs.

4.2.1 EMR 4530-X1-Series Calibrate Card

The calibrate card used in these units is shown schematically in EMR drawing 15800 in Section 5 of this manual. This card does not contain any calibration components and is used only as a jumper card. Data inputs and input commons for both VCO's and the subcarrier outputs from the VCO's are routed through this card. Output transformers are included on all cards (except the 4530-91) which provide floating subcarrier outputs. Subcarrier outputs for the 4530-91 are direct coupled and are thus single-ended.

4.2.2 EMR 4530-X2-Series Calibrate Card

The calibrate card used in these units is shown schematically in EMR drawing 16131 in Section 5 of this manual. This card contains calibration relays which interrupt the separate data inputs to the VCO's and instead connects a calibration voltage input to both VCO's. Both the data input and input return are switched to an external calibrate input and calibrate input return. The calibration voltage is supplied from external devices. Switching is performed by calibrate commands also derived from external equipments.

Subcarrier outputs from the VCO's are routed through this card to the 4530 outputs. Transformer coupling at the outputs (for all but the 4530-92) provides floating subcarrier outputs. For the 4530-92, the output transformers are not included and the jumpers are installed instead providing single-ended outputs.

4.2.3 EMR 4530-X3- and -X4-Series Calibrate Card

The calibrate card used in these units is shown schematically in EMR drawing 16130 in Section 5 of this manual. This card contains a built-in calibration network and switching relays which interrupt the separate data inputs to the VCO's and instead connects the calibration voltages to the VCO's. The calibration network consists of two voltage dividers operating from the + and −18 volt regulated DC source. These networks are connected to the plus and minus calibration relays. Calibration commands (+, −, and 0) are derived either from the front panel CAL switch or from an external source, depending on the particular 4530. For the 4530-X3, calibration commands are derived from an external source. Calibration commands for the 4530-X4 are selected at the front panel CAL switch. Subcarrier outputs from both VCO's are also routed through this card.

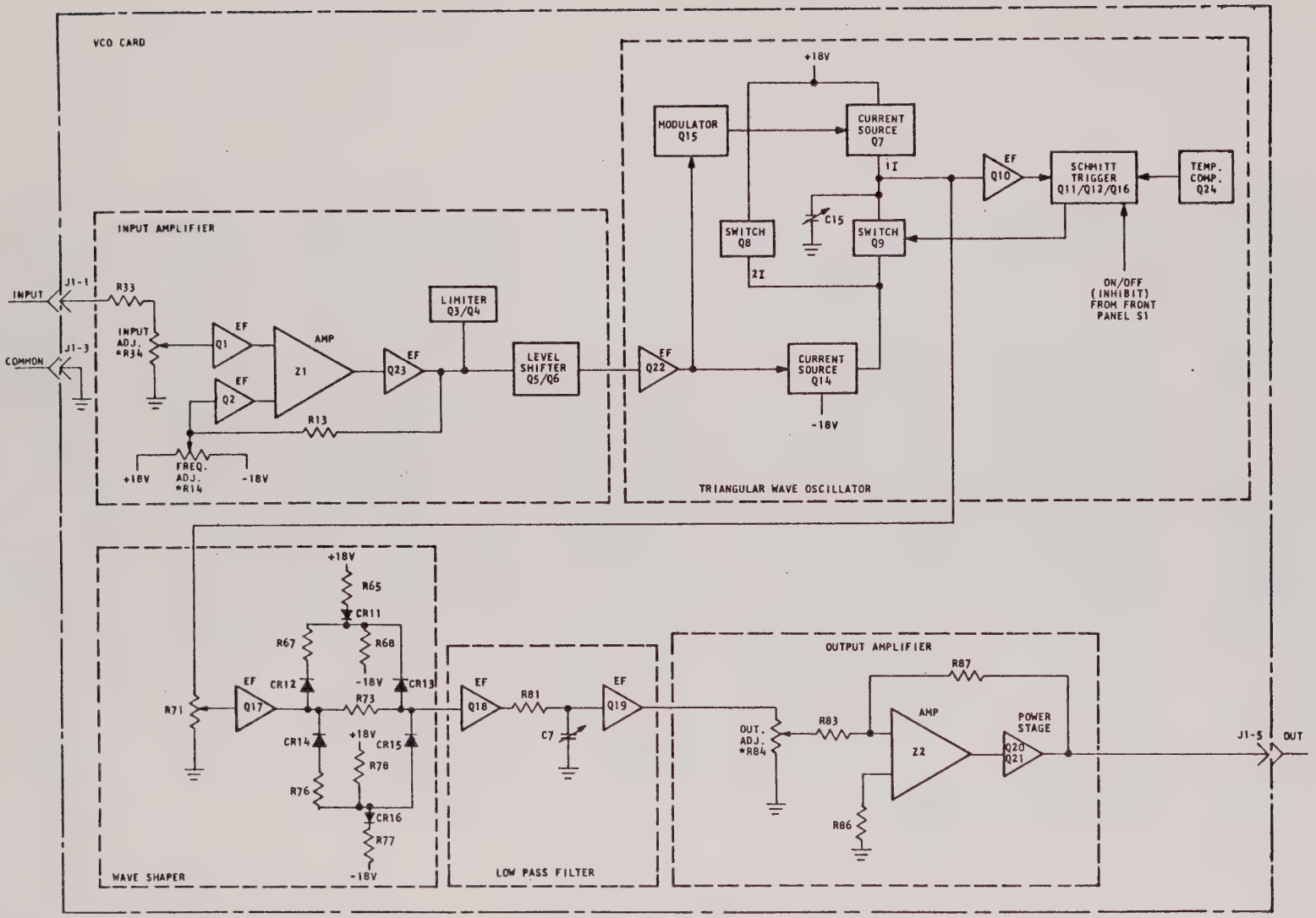
Transformer coupling is used for the 4530-X3 and -X4 VCO outputs (except the 4530-93 and -94 versions) which provides floating subcarrier outputs. For the 4530-93 and -94 versions, jumpers are installed instead of the transformers and the subcarrier outputs are thus single-ended.

4.3 VOLTAGE-CONTROLLED OSCILLATOR (VCO) CARD

The 4530 contains two identical subcarrier oscillators, each located on a VCO card. Therefore, the circuit description in this paragraph is used for either of the VCO cards. An overall block diagram of the VCO card is shown in Figure 4-1. The schematic diagram for the VCO card is shown in EMR drawing 15794 in Section 5 of this manual.

The VCO input is routed through card terminal J1 pin 1 to the INPUT control R34. This resistor adjusts the gain of amplifier (Z1) such that any input signal from 1 volt peak-to-peak to 10 volts peak-to-peak may be used to provide an output to the oscillator corresponding to full-bandwidth deviation. A second input to Z1 is an offset level established by FREQ control R14. This control provides continuous offset adjustment of the amplifier to either bandedge equivalent. A limiter circuit, Q3 and Q4, establishes the maximum voltage swing at the amplifier output. Positive and negative stages in the limiter are triggered when the voltage level increases or decreases to the reference level established in the limiter. This limiting action prevents the oscillator from being over deviated. A level shifting stage, Q5 and Q6, changes the modulating voltage levels to the level necessary for proper operation of the oscillator.

The oscillator is a triangular wave generator which is set to operate at a nominal frequency of the selected subcarrier channel. Operating frequencies within the subcarrier channel are controlled by an input voltage from the input amplifier circuits. In the quiescent state (no input from the input amplifier circuits), the operation of the oscillator is as follows:



NOTES:

1. *--ADJUSTMENTS AS VIEWED FROM FRONT PANEL.
2. DWG. CONTROL NO. 4530-002.

Figure 4-1. VCO Card Detailed Block Diagram

a. Transistor switch Q8 is closed and Q9 is open. Two units of constant current are drawn by current source Q14 through switch Q8. Simultaneously, one unit of constant charging current charges C15 from current source Q7.

b. Constant charging current in C15 produces a linear ramp voltage at the output which is coupled through emitter-follower Q10 to Schmitt trigger Q11, Q12, and Q16. When this voltage increases to a specified level, the Schmitt trigger turns on and supplies an output which closes switch Q9.

c. When Q9 is closed, switch Q8 is automatically opened due to the coupling between Q8 and Q9. The two units of current through Q14 must, in this condition, flow through switch Q9. Since current source Q7 provides only one unit of current, the second unit of current flows from capacitor C15 which is the discharge current for C15. Since the discharge current is also constant, the ramp voltage at C15 decreases linearly.

d. The linear decrease in ramp voltage at C15 is monitored by the Schmitt trigger. When this voltage decreases to a specified level, the Schmitt trigger turns off and opens switch Q9. Switch Q8 is again closed and one oscillator cycle is complete. This process repeats for each cycle of the oscillator.

e. The frequency of the oscillator is established by timing capacitor C15. Increasing or decreasing the value of this capacitor, in turn, increases or decreases the time required to charge and discharge, thus determining the slope of the ramp voltage. The peak-to-peak amplitude of the triangular wave is held constant by the switching level of the Schmitt trigger, therefore, a change in slope represents a change in frequency.

f. The levels at which the Schmitt trigger are operated are determined primarily by zener diode CR7 and the amount of current drawn by current source Q16.

g. A temperature compensation network, Q24, operates in conjunction with the Schmitt trigger. This network increases or decreases the biasing in the Schmitt trigger to compensate for enviromental temperature changes.

The oscillator modulation is performed by modulating the current through the current sources. Both current sources are modulated so that the positive-going portion of the ramp voltage is changed when C15 is charged, and the negative-going portion is changed an equal amount when C15 is discharged. This maintains a symetrical triangular wave output which changes only in frequency.

The wave shaper circuits are diode cornering networks which convert the triangular wave subcarrier input to a sine wave signal. This network includes two positive stages and two negative stages which operate on the positive and negative portions, respectively, of the triangular wave subcarrier input. Each stage in the networks is set to turn on when the signal increases to a specified level. This level is the break point of the stage. The break points of the two stages in the networks are staggered such that the first stage turns on at a lower level than the second stage. Thus, when the signal level increases (either positive or negative), the first stage turns on providing a certain rounding effect. As the signal further increases, the second stage turns on and additional rounding is provided. When the signal reverses direction, the stages are thus turned off in reverse order. The turning on of the stages exhibits a load on the signal input which performs the rounding effect. The loading characteristics of the diode and resistor stages are non-linear because of the non-linearity required to produce a sine function.

The output of the wave shaper is essentially a sine wave subcarrier signal; however, a certain peak remains in the waveform due to the instantaneous polarity change at the peak of the triangular wave. To eliminate the remaining distortion in the sine wave subcarrier, the signal is passed through a single-pole low-pass filter network. The resultant signal is developed across OUT potentiometer R84. The signal level selected at this potentiometer is amplified by an amplifier and power stage and routed to the VCO card output terminal J1-5.

4.4 POWER SUPPLY COMPONENTS AND REGULATOR CARD

The power supply components and regulator card are included in all 4530's except the 4530-9X series. Regulated DC power for operation of the 4530-9X series is provided from an external power supply. An overall block diagram of the power supply components and regulator card circuits is shown in Figure 4-2. The power supply components are illustrated in detail in the system schematic, EMR drawing 16135, in Section 5 of this manual. The schematic diagram for the regulator card is shown in EMR drawing 15796 also in Section 5.

The primary AC power input is routed through the rear connector J1 and fuse, F1, to the primary winding of T1. Two secondary windings are connected to two full-wave diode rectifiers. These rectifiers supply the unregulated DC voltages for operation of four regulator circuits on the regulator card. Each rectifier supplies power to a +18-volt and a -18-volt regulator.

Since the four regulators are of the same basic configuration, only one +18-volt regulator is shown in the block diagram, Figure 4-2. Each VCO is powered by a separate set of + and −18-volt regulators which are floating with respect to each other. This makes possible independent VCO operation with floating inputs.

The regulators are conventional series regulator circuits. Regulation is performed by comparing a sample of the output potential with a voltage reference developed by zener diode CR3. A differential amplifer, Q3 and Q4, detects any voltage difference and routes a correction voltage back to the series control transistor Q1. This component increases or decreases the biasing of series regulator transistor, Q1, (mounted on the chassis) which compensates for voltage variations at the output.

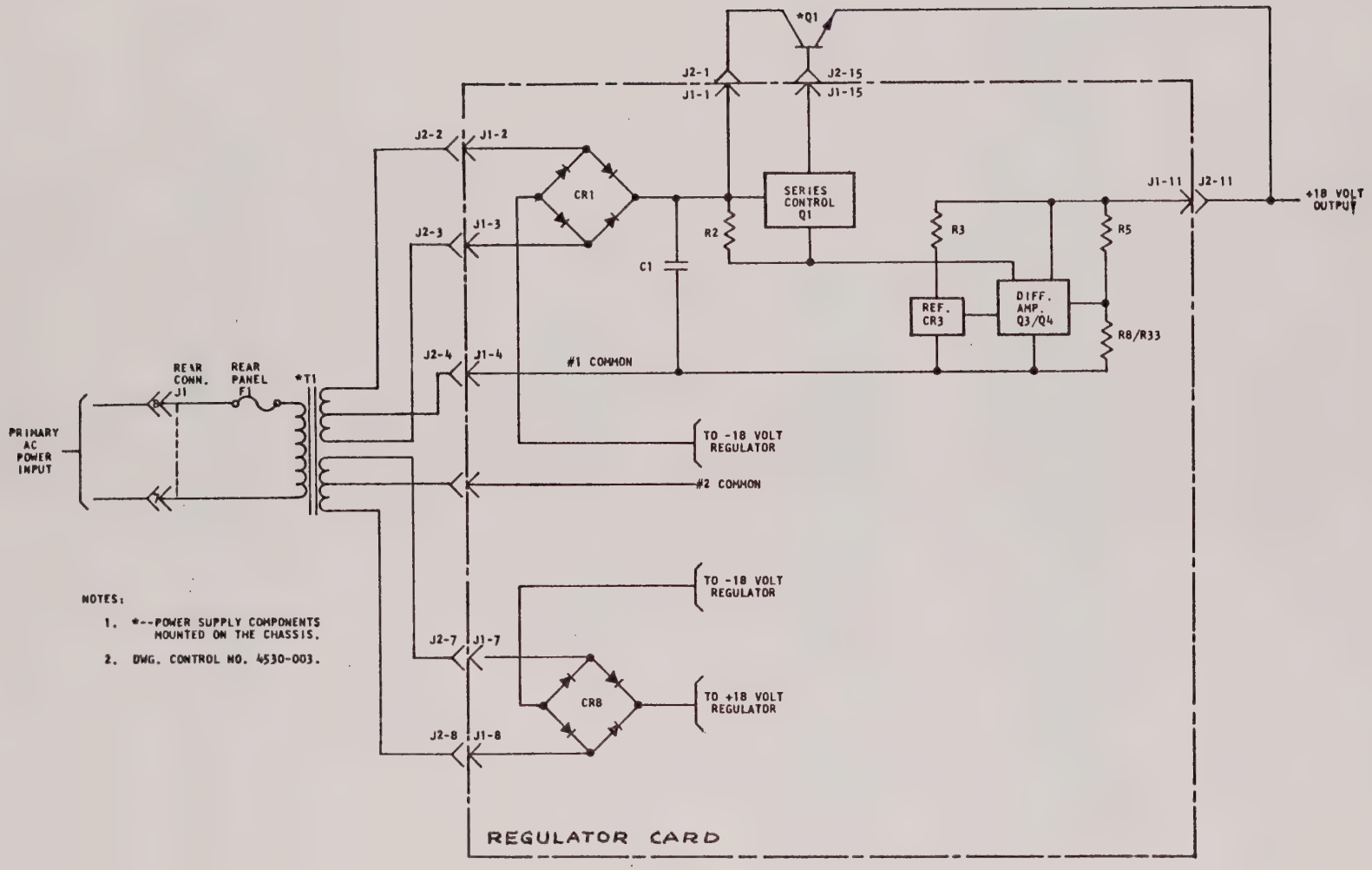


Figure 4-2. Power Supply and Regulator Detailed Block Diagram

SECTION 5

MAINTENANCE

5.1 GENERAL

This section contains information to aid in maintaining the EMR 4530. The maintenance information includes a Maintenance Guide (paragraph 5.2), Adjustment Procedures (paragraph 5.3), and Drawings (paragraph 5.4). Prior to attempting any maintenance of the 4530, the operator should be thoroughly familiar with the operating procedures and theory of operation as contained in Sections 3 and 4 of this manual.

5.2 MAINTENANCE GUIDE

This paragraph outlines the method for troubleshooting and repair of the 4530. In the event an abnormal condition is detected in the unit operation, the following general method of isolating and repairing the trouble is recommended.

a. Perform an inspection (paragraph 5.2.1).

b. Perform troubleshooting procedures (paragraph 5.2.2).

c. When defective component is located, refer to Section 6, Parts List, for replacement component information.

d. Recheck affected circuit to ascertain that the malfunction is repaired.

e. Perform adjustments in affected circuit when necessary (paragraph 5.3).

5.2.1 Inspection

The Model 4530 should be subjected to a regular inspection program similar to that recommended for other types of electronic equipment. The inspection program should be performed periodically as a means of preventive maintenance, or if a malfunction occurs, to aid in isolating the trouble. The inspection guide is as follows:

a. Inspect front and rear panel components for signs of damage.

b. Inspect wiring for loose or broken connection.

c. Inspect printed-circuit cards for mechanical damage or component discoloration.

d. Inspect printed-circuit card connectors for signs of damage.

5.2.2 Troubleshooting

An electrical malfunction in the 4530 will normally be located on one of the printed-circuit cards in the unit. The following general steps are provided to check the operation of the cards and to isolate a malfunction.

a. Refer to the system schematic diagram, EMR drawing 16135, and check the regulated DC voltage outputs. These voltages should be ±18 volts ±0.1 volt. If the voltages are within tolerance, refer to step (b) of this procedure. If voltages are not within tolerance, refer to the theory description in paragraph 4.4 and to the regulator card transistor voltage measurements in Table 5-1, and troubleshoot the power supply/regulator circuits.

b. The calibrate card configuration varies significantly depending on the particular model of the 4530. However, the card circuits for all configurations are primarily switching networks. Refer to the theory description in paragraph 4.2 and check the switching networks, calibrate inputs (where applicable) or data signal inputs, and subcarrier outputs.

c. The VCO cards contain several functional circuits as shown in the card detailed block diagram, Figure 4-1. To isolate a malfunction on the VCO card, a checkout procedure is provided to check each functional circuit. When in the course of this procedure, a malfunctioning circuit is located, refer to the VCO card schematic diagram (EMR drawing 15794) and VCO card voltage measurement and waveforms table (Table 5-2), and troubleshoot the appropriate circuit. The equipment necessary to perform this procedure is as follows:

1. Signal Generator -- Hewlett Packard 200CD or equivalent.

2. Oscilloscope -- Tektronix 535 or equivalent.

3. Frequency Counter -- Hewlett Packard 5245L or equivalent.

The checkout procedure is as follows:

1. Operate the VCO under test in the data mode with no signal input and no subcarrier output termination.

2. Using the oscilloscope, monitor the junction of resistors R22 and R24 and adjust front panel FREQ control for a 0-volt indication.

3. Using the external signal generator, apply a 500 Hz signal of approximately 10 volts peak-to-peak to the VCO via rear connector signal input terminal.

4. Using the oscilloscope, monitor the junction of resistors R22 and R24 and adjust front panel INPUT control for a 5-volt peak-to-peak indication. This indicates proper operation of the input amplifier.

5. Increase the signal level at the external signal generator and observe that the limiting occurs on both positive and negative peaks at approximately ±3.2 volts. This indicates proper operation of deviation limiting.

6. Remove the signal input from the VCO. The input amplifier check is complete.

7. Using the oscilloscope, monitor the oscillator output at capacitor C15. This output should be a triangular wave subcarrier signal of approximately 4.5 volts peak-to-peak.

8. Connect the frequency counter to the output jack on the oscilloscope. Monitor capacitor C15 and check the oscillator frequency. Frequency should be approximately center frequency of the subcarrier channel.

9. Rotate front panel FREQ control in both directions and monitor the oscillator frequency to ascertain that both bandedge frequencies are obtainable. The oscillator check is complete.

10. Using the oscilloscope, monitor the waveshaper signal at the emitter element of transistor Q18. This signal should be a sine wave subcarrier signal of approximately 0.8 volts peak-to-peak.

11. Using the oscilloscope, monitor the output amplifier input at the input side of resistor R83. This signal amplitude depends on the setting of R84.

12. Using the oscilloscope, monitor the output amplifier output at VCO card OUTPUT terminal J1-5.

13. Rotate front panel OUT control fully clockwise to ascertain that a sine wave subcarrier signal of at least 2 volts RMS is obtainable.

5.3 ADJUSTMENTS

The adjustments in this paragraph may be used for readjustment after unit repair or they may be used to checkout and adjust the 4530 after long periods of operation. The procedure is provided at the card level so that any card may be adjusted independently.

Any adjustments contained in the procedure may be performed without specialized equipment. However, adjustments in the unit not contained in the procedure should not be attempted in the field. Specifically, adjustments in the temperature compensation circuit are critical and require special environmental equipments to perform the adjustment. Should adjustment in this circuit be necessary, return the unit to EMR.

A list of the equipments necessary to perform this procedure is as follows:

a. DC Voltmeter, Fluke 825A or equivalent.

b. Frequency Counter, Hewlett Packard 5245L or equivalent.

c. Distortion Analyzer, Hewlett Packard 331A or equivalent.

d. DC voltage source accurate to ±0.1%.

5.3.1 Calibrate Card Adjustments

Adjustments are provided only on the calibrate card in the 4530-X3- and -X4- series units. These cards contain adjustments for the built-in calibrator circuits. The calibrator adjustments are as follows:

a. Refer to EMR Drawing 16130.

b. Supply calibration command to CAL COMMAND (+), 24 ±6 volts, either from external equipments or front panel CAL switch depending on the particular unit.

c. Using the DC voltmeter, monitor VCO card 1 input (card terminal J1-1).

d. Determine positive calibration voltage from model number on the unit (See Table 2-1).

e. Adjust calibrate card potentiometer R5 for the specified calibration voltage ±0.2%.

f. Using the DC voltmeter, monitor VCO card 2 input (card terminal J1-1).

g. Adjust calibrate card potentiometer R7 for the specified calibration voltage ±0.2%.

h. Supply calibration command to CAL COMMAND (−).

i. Using the DC voltmeter, monitor VCO card 2 input (card terminal J1-1).

j. Determine negative calibration voltage from model number on the unit (See Table 2-1).

k. Adjust calibrate card potentiometer R13 for the specified calibration voltage ±0.2%.

l. Using the DC voltmeter, monitor VCO card 1 input (card terminal J1-1).

m. Adjust calibrate card potentiometer R11 for the specified calibration voltage ±0.2%.

5.3.2 VCO Card Adjustments

Since the two VCO cards are identical, the adjustment procedure as provided in this paragraph may be used for either card. Adjustments on the VCO cards are primarily involved with adjusting the linearity and symetry of the oscillator, and distortion nulling of the waveshaper. Symetry adjustments affect the distortion of the VCO card circuits. Center frequency and deviation parameters for the cards are set at the factory and require no further adjustment. Frequency offset and input level adjustments are performed at the front panel FREQ and INPUT controls. These controls are considered operating components and do not require adjustment procedures. Operating controls are described in Section 3 of this manual.

The VCO card adjustment procedure is provided in four sections, (1) a calibration setup procedure for use in conjunction with the oscillator linearity and symetry adjustments, (2) the oscillator linearity adjustment, (3) the oscillator symetry adjustment, and (4) the waveshaper adjustments. The adjustment procedure is as follows:

a. Oscillator Calibration --

1. Short the VCO input to the input return or unit common at the rear connector.

2. Using the frequency counter, monitor the VCO output at the appropriate front panel test jack.

3. Adjust the front panel FREQ control until the output frequency is equal to the center frequency of the VCO (within ±0. 1%).

4. Remove the input short and apply a positive DC calibration voltage, equal to full scale deviation, at the input. (If the 4530 contains a built-in calibrator, the internal positive calibrate voltage can be used for this input.)

5. Adjust the front panel INPUT control until the output frequency is equal to the upper bandedge of the VCO (within ±0. 1%).

6. Repeat steps 1 through 5 to ascertain that center frequency and upper bandedge frequencies are within ±0. 1% of the specified frequencies.

b. Oscillator Linearity -- This procedure is primarily, applicable for oscillators operating at center frequencies of 50 KHz or above. Some deviation of this rule exists, however. Refer to the VCO card and observe whether a jumper is installed between card terminals E1 and E2. If a jumper is installed, this procedure is not applicable. If a jumper is not installed, proceed as follows:

1. Using the frequency counter, monitor the appropriate front panel test jack.

2. Perform a three-point linearity check (upper bandedge, center frequency, and lower bandedge frequencies) using the positive and negative calibration voltages as established in step (a) of this procedure.

3. If best-straight-line linearity is within 0. 1% of bandwidth, the adjustment is proper. If not, proceed to step 4.

4. Rotate potentiometer R37 1/2 turn at a time and perform three-point linearity checks until the

0.1% of bandwidth is obtained. Rotations of less than 1/2 turn may be necessary when the adjustment is close.

c. Oscillator Symetry --

1. Using the distortion analyzer, monitor the emitter element of transistor Q13 on the VCO card.

2. Offset the oscillator frequency to the lower bandedge using the calibration setup in step (a) of this procedure.

3. Adjust potentiometer R56 for a minimum distortion indication.

4. Offset the oscillator frequency to upper bandedge.

5. Adjust potentiometer R60 for a minimum distortion indication.

6. Repeat this procedure until a minimum distortion indication is obtained.

d. Wave Shaper --

1. Using the distortion analyzer, monitor the appropriate front panel OUT test jack.

2. Remove the signal input to the VCO.

3. Adjust potentiometers R74 and R71 (in that order) alternately, until a minimum distortion indication is obtained.

5.4 DRAWINGS

The 4530 drawings are arranged in descending order starting with the top assembly diagram and continuing through all subassembly, schematic, and wiring diagrams. Table 5-3 lists the drawings, the order in which they appear in this manual, the EMR drawing numbers, and the page numbers.

Subassemblies and/or components of the assemblies on the assembly drawings are identified by reference numbers within the balloons. These numbers correspond to item numbers on the associated parts list in Section 6 of this manual. The assembly drawing and associated parts list are identified by the same number. For example, the subassemblies shown in the top assembly drawing, 14991, are listed by item number on PL-14991 in Section 6.

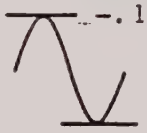
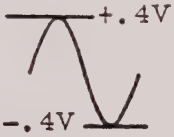
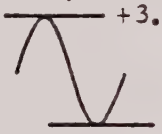
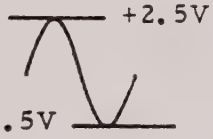
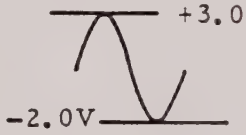
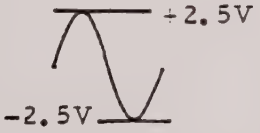
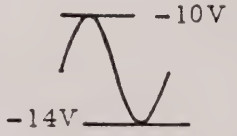
This parts list outlines the subassemblies by name and assembly drawings in which the subassemblies are illustrated. For example, item 2 on drawing 14991 is identified on PL-14991 as the front panel assembly which is illustrated independently on EMR drawing 14990. The parts on this assembly are listed on PL-14990. Subsequent assembly drawing and parts breakdown is performed in the same manner.

Certain assembly drawings illustrate more than one configuration of the assembly. When this is the case, dash (-) numbers are used following the assembly number to identify the configuration. An APPLICATION Chart in the lower center of the assembly drawing lists the configurations of the assembly and the particular units on which the assemblies are used. The dash numbers also identify the parts lists in Section 6 for the various configurations.

Table 5-1. **Regulator Card Transistor Voltage Measurements (Ref. EMR Drawing 15797)**

COMPONENT	EMITTER	BASE	COLLECTOR
NOTE Voltage levels provided are typical for one +18-volt regulator and one −18-volt regulator. Voltage levels at corresponding components in the remaining regulators are identical to those provided below.			
+18-VOLT REGULATOR			
Q1	2V P-P DC LEVEL 37V DC	36.2V DC	18.6V DC
Q3	8.4V DC	9V DC ±5%	36.2V DC
Q4	8.4V DC	9V DC	18V DC
−18-VOLT REGULATOR			
Q5	−8.4V DC	−9V DC ±5%	−36.2V DC
Q6	−8.4V DC	−9V DC	−18V DC
Q7	2V P-P DC LEVEL −37V DC	−36.2V DC	−18.6V DC

Table 5-2. VCO Card Voltage Measurements and Waveforms (Ref. EMR Drawing 15794)

COMPONENT	EMITTER	BASE	COLLECTOR
	NOTE The following waveforms are based on an input of 10V peak-to-peak at a data frequency within the 4530 specifications. FREQ control set for center frequency and INPUT control set for full-bandwidth deviation. Deviation is ±40%.		
Q1	NA	SAME AS Q2 B	+12V DC
Q2			+12V DC
Z1	PIN 7 		
Q3		+2.5V DC	GRD
Q4	SAME AS Q3 E	-2.5V DC	GRD
Q5*			-18V DC
Q6*	+6.6V DC	+6.0V DC	

* These voltage levels are based on using a ±40% deviation unit. Levels will decrease for units with lower deviations.

Table 5-2 (Cont'd.). VCO Card Voltage Measurements and Waveforms (Ref. EMR Drawing 15794)

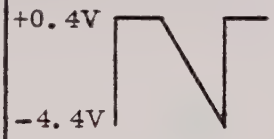
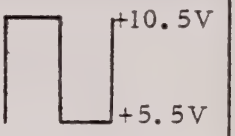
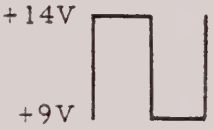
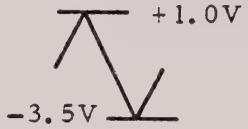
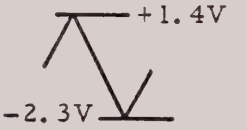
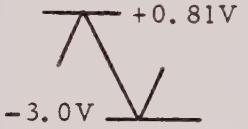
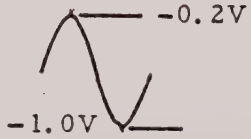
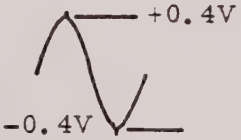
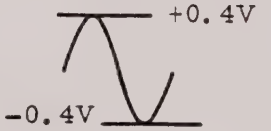
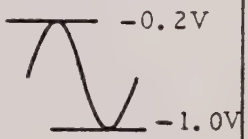
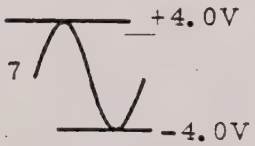
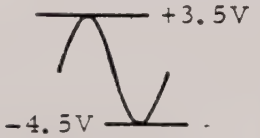
COMPONENT	EMITTER	BASE	COLLECTOR
Q11		SAME AS Q10 E	
Q12	SAME AS Q11 E		
Q13		SAME AS Q9 C	+18V DC
Q16	-12.6V DC	-12V DC	
Q24	-12V DC	-11.4V DC	GRD
Q17			-18V DC
Q18			+18V DC
Q19			-18V DC
Z2			
Q20		SAME AS Z2-7	+18V DC

Table 5-2 (Cont'd.). VCO Card Voltage Measurements and Waveforms (Ref. EMR Drawing 15794)

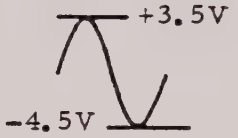
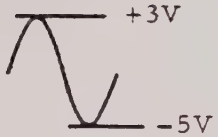
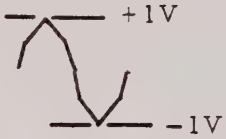
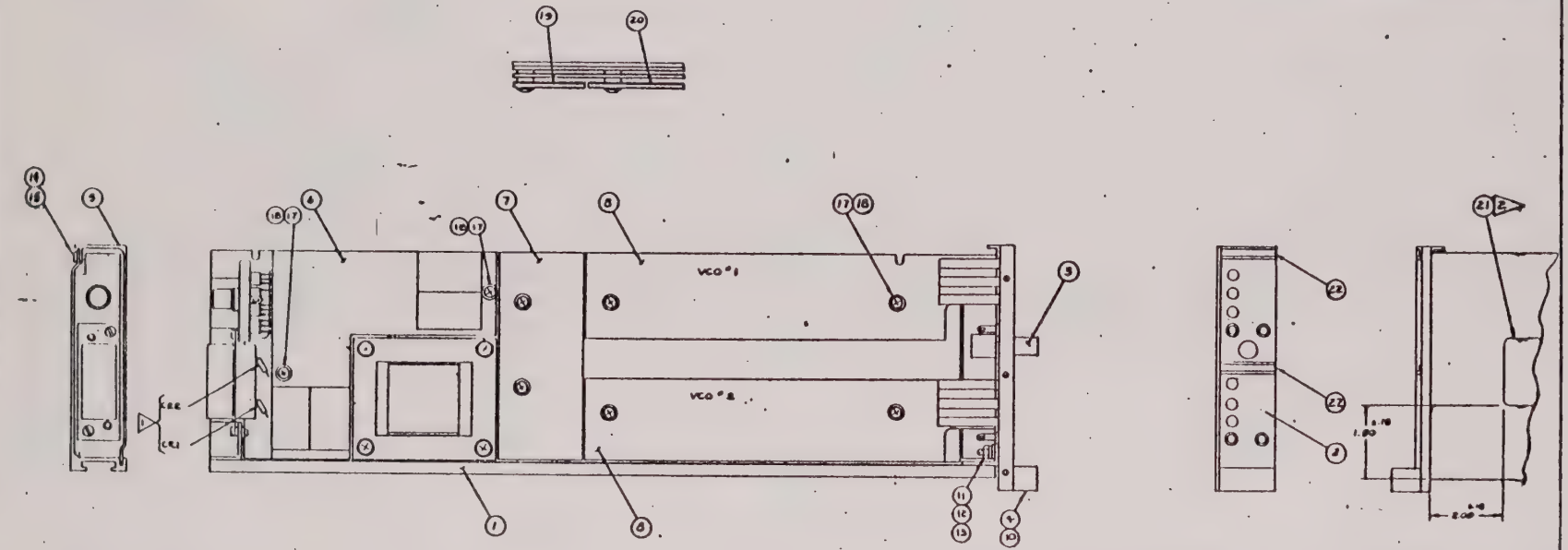
COMPONENT	EMITTER	BASE	COLLECTOR
Q21			-18V DC
JUNCTION OF CR12/CR14			

Table 5-3. List of Drawings

NAME	NUMBER	PAGE NO.
Model 4530 Dual VCO Oscillator Assembly	14991	5-15
Model 4530 Dual VCO Chassis Assembly	14992	5-16
Interconnection Printed-Wiring Assembly	15908	5-17
Front Panel Assembly	14990	5-18
Regulator Card Printed-Wiring Assembly	15799	5-19
Schematic	15797	5-20
Calibrate Card Printed-Wiring Assembly	15906	5-21
Schematic	15800	5-22
Schematic	16131	5-23
Schematic	16130	5-24
VCO Card Printed-Wiring Assembly	15796	5-25
Schematic	15794	5-26
Model 4530 System Schematic	16135	5-27



NOTES:

1. INSTALL CR1 & CR2 PER WIRING SCHEMATIC 16135. SLEEVE LEADS USING ITEM 20 AR.
2. APPLY INFORMATION TO NAMEPLATE PER EMR 13906, CLASS B, TYPE 1B.

REV	DESCRIPTION	BY	DATE
A	SEE ECO 39363 DTD 10-19-66		
B	SEE ECO 39363 DTD 10-19-66		
C	PWK ADDED -3 & -4 TO MFR # 11-19-66		
D	ECO 39363 (1-20-67) ADDED ITEMS 19 & 20		
E	PWK ADD VCO #1 & #2 INCR. TO 210		
F	ECO 41280 ADD ITEM 20 & NOTE 2		
G	ECO 41758 ADD ITEM 22		
H	VCO #1 & #2 MODIFIED		

ITEM	PART NO	DESCRIPTION
1	184-89-00052	FOR PARTS LIST SEE PL 14991-7
2	84-83-C0052	PL 14991-6
3	184-89-00051	PL 14991-5
4	(5-83-C0046)	PL 14991-4
5	23-83-C0095-2	PL 14991-3
6	23-83-C0095-1	PL 14991-2
7	24-83-C0095	PL 14991-1
8	24-85-C0095	FOR PARTS LIST SEE PL 14991

LIST OF MATERIALS

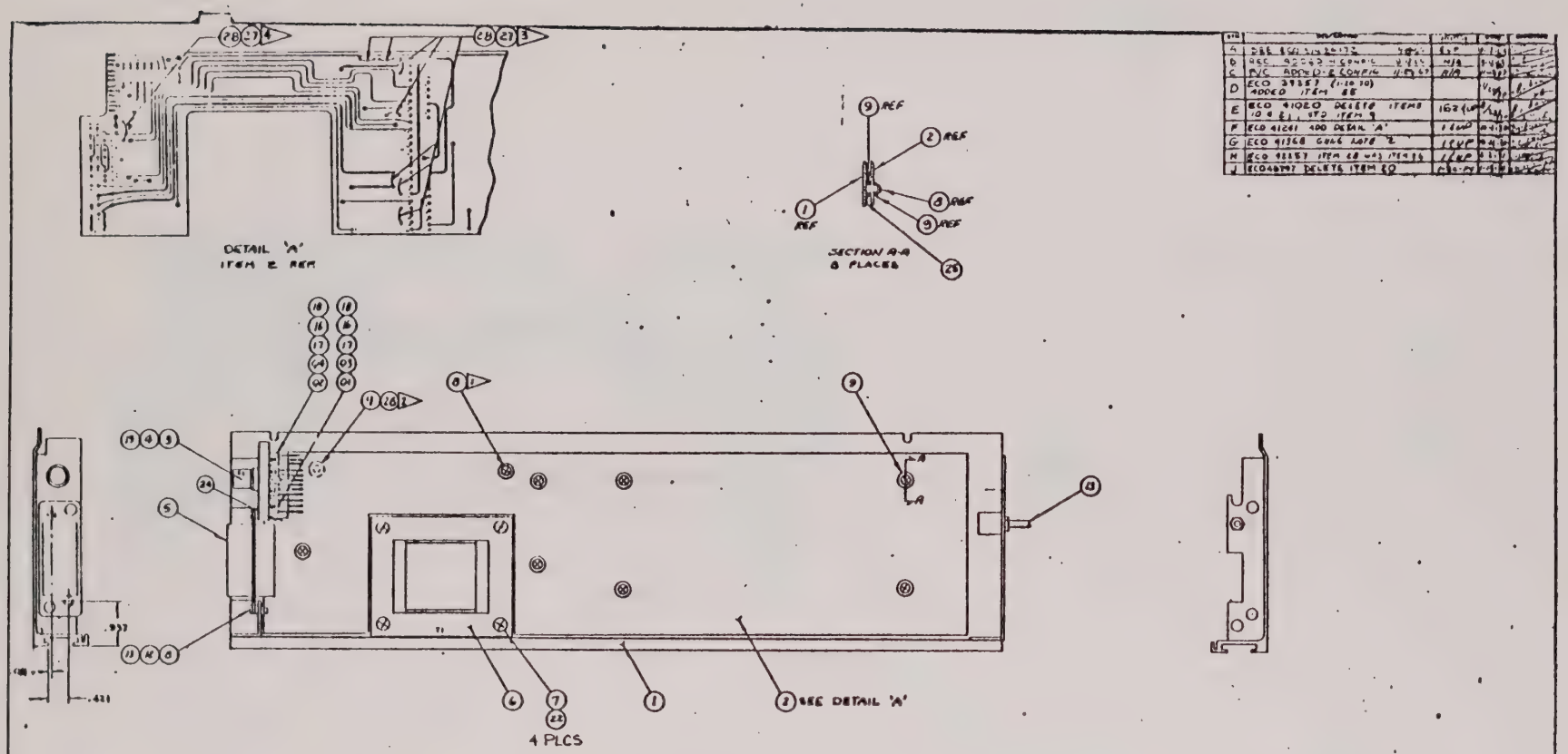
-9	FINAL	4530	
-6			
-5			
-4			
-3			
-2			
-1			
OSC	FINAL	4530	

FAIRBROTHER 5-20-68

EMR

OSC. ASSEMBLY, DUAL VC
MODEL 4530

CAGE NO	SIZE	DWG NO	REV
06141	D	14991	H
SCALE		184-89-C0035	SHEET 1 OF 1



LTR	DESCRIPTION	DATE	APPROVED
A	SEE ECO 91313 SHEET 2	10-70	
B	ECO 92093 + COMPL	11-70	
C	P/C ADDED & COMPL	11-70	
D	ECO 39567 (1-10-72) ADDED ITEM 28		
E	ECO 91020 DELETE ITEMS 10 & 11, ADD ITEM 9	1-72	
F	ECO 91241 ADD DETAIL 'A'	1-72	
G	ECO 91368 GOLD PLATE 2	1-72	
H	ECO 92187 ITEM 28 WAS ITEM 29	1-72	
J	ECO 40971 DELETE ITEM 28	6-73	

NOTES:
1. ITEM 8 TO BE REMOVED AT FINAL ASSEMBLY AND INSTALLED FOR CARD RETAINING.
2. INSTALL ITEM 9 APPROX WHERE SHOWN BETWEEN ITEM 25 & ITEM 2. USING ITEM 26 BOND ITEM 9 TO ITEM 25.
3. FOR MODEL 4530-X8 INSTALL JUMPERS WHERE SHOWN.
4. FOR MODEL 4530-X4 INSTALL JUMPER FOR INT. CAL. LOCAL CONTROL.

082-89-00151	FOR PART LIST SEE PL-14225-6	
082-89-00152	FOR PARTS LIST SEE PL M-2224-1	
082-89-00153	FOR PARTS LIST SEE PL 14992	

LIST OF MATERIALS

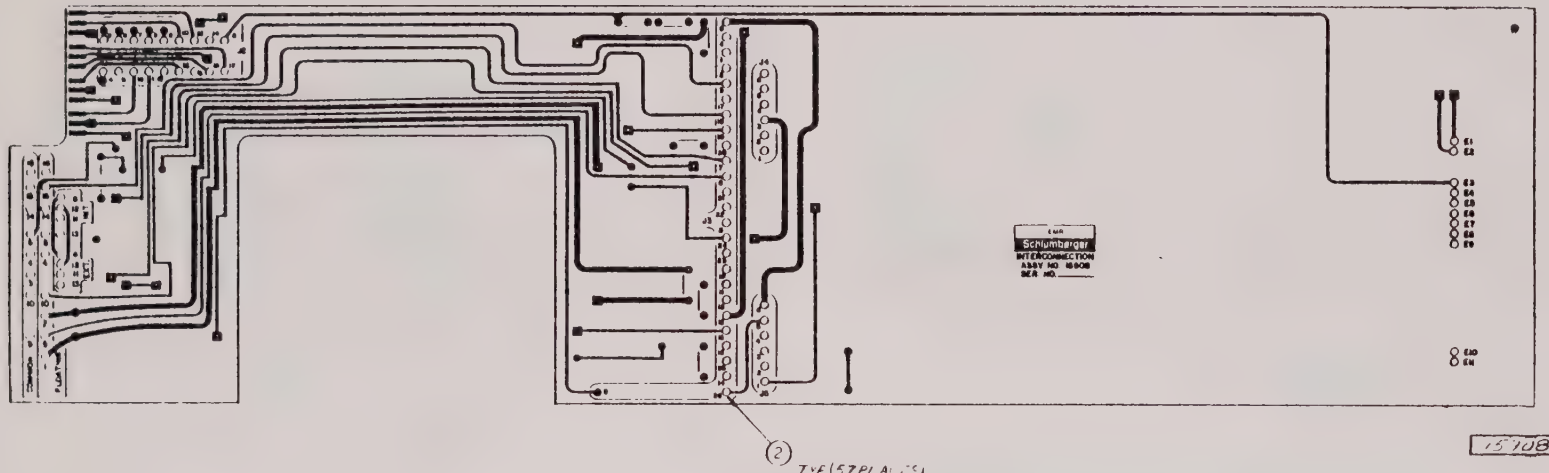
-E	13241-3	91-10-0318	
-E	93251-6	9530-5E	
-E	93251-5	91-10-81	
-1			
-1	91142	91-10-82	
ASC	14921	4520	

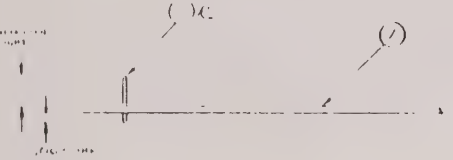
DRAWN: G. FAIRBROTHER 6-1966
DESIGNED: J. Wade 6-66
ENGINEER: J. Wade 6-66
PROJECT ENGINEER: W. S. Newton 7/1/72
APPROVED: W. S. Newton 7/1/72

CHASSIS ASSEMBLY
MODEL 4530, DUAL VCO

86141 | D | 14992 | J

082-89-00990 | SHEET 1 OF 1





ARTWORK REVISION INDEX

REVISIONS

PARTS LIST

EMR TELEMETRY

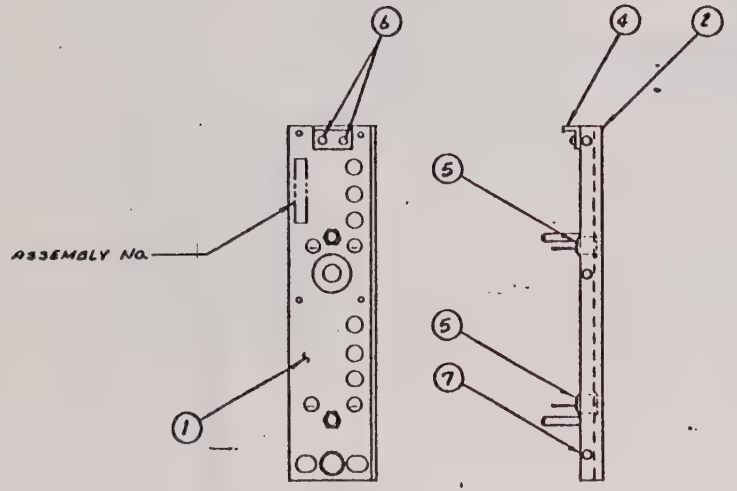
PRINTED WIRING A. (MEL
INTERCONNECTION

D | 15908 | C

REVISION INDEX								
SHEET NO.	1							
REVISION	A							

REVISIONS

SYM	DESCRIPTION	EFFECTIVE	DATE	APPROVED
A	ECO #7784 REVISED PANEL MARKING 36° WAS 30° NEG LND SWITCH	8696 UP	7/7/93	



14990

THIS L/M FOR REF. ONLY FOR P/L SEE EOA P/L 14990.

REQUIRED		BASIC	REF DES	C.	PART NO.	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR SYMBOL
				C	MKL 14990	MARKING			8
			7		229-02-00218	SCREW			7
			2		229-02-00217	SCREW			6
			4		193-58-0XXXA	JACK			5
			1	C	6012	BRKT, LOCATING			4
			2	B	15719	IDENT, RETAINER			3
			1		14993	STRIP			2
			1	C	15717	PNL ASSY. FRONT			1

LIST OF MATERIALS

NOTES:
1. PAINT AND LETTER PER POA.

BSC	14991	4530
DASH NO	NEXT ASSY NO	USED ON

APPLICATION

DO NOT APPLY PART NO. PER
EMR 13406 CL-A, TYPE I
LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING
MATERIAL
TREATMENT OR FINISH

		DATE
DRAWN BY	B. FAIRBROTHER	5-20-69
DESIGNER		
CHECKER		
DESIGN ENGINEER		
PROJECT ENGINEER	J. Nadeau	6/1/69
APPROVED		
APPROVED		

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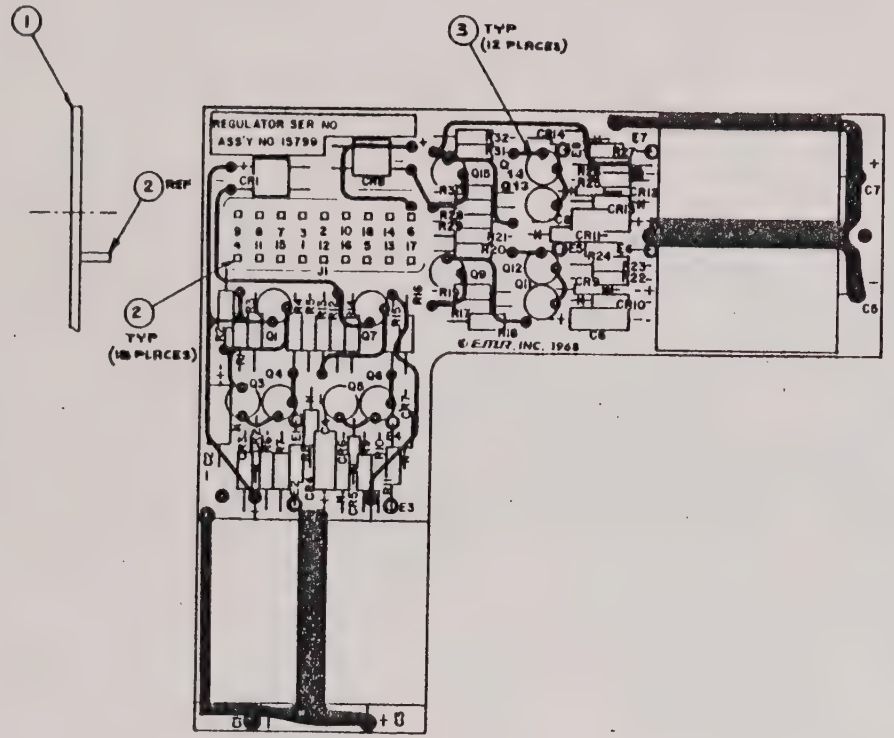
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA

ASSEMBLY PANEL, FRONT

SDC

CODE IDENT NO.	SIZE	DWG NO.	REV
06141	C	14990	A
SCALE 1/1		191-89-0024C	SHEET 1 OF 1



REVISIONS

SYM	DESCRIPTION	MODEL EFFECTIVE	DATE	APPROVED

-2 REQUIRED	-1 REQUIRED	BASIC	A	205-89-00494	FOR PARTS LIST SEE P/L 15799
			UWG SIZE	PART NO	DESCRIPTION

PART CLASS | MFG CODE | ITEM OR SYMBOL

LIST OF MATERIALS

ESC	14991	4630
DRAW NO	NEXT ASSY NO	USED ON

APPLICATION

DO NOT APPLY PART NO. PER

LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED

TOLERANCES

DECIMALS | ANGLES | SURFACE FINISH

DO NOT SCALE DRAWING

MATERIAL

TREATMENT OR FINISH

		DATE
DRAWN BY	L.B. Ogle	3-5-68
DESIGNED	E.L. Bailey	3-5-68
CHECKED		4-3-68
DESIGN ENGINEER		
PROJECT ENGINEER	John S. Norton	4/5/68
APPROVED		
APPROVED		

EMR SARASOTA DIVISION © EMR, INC. 1968
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA

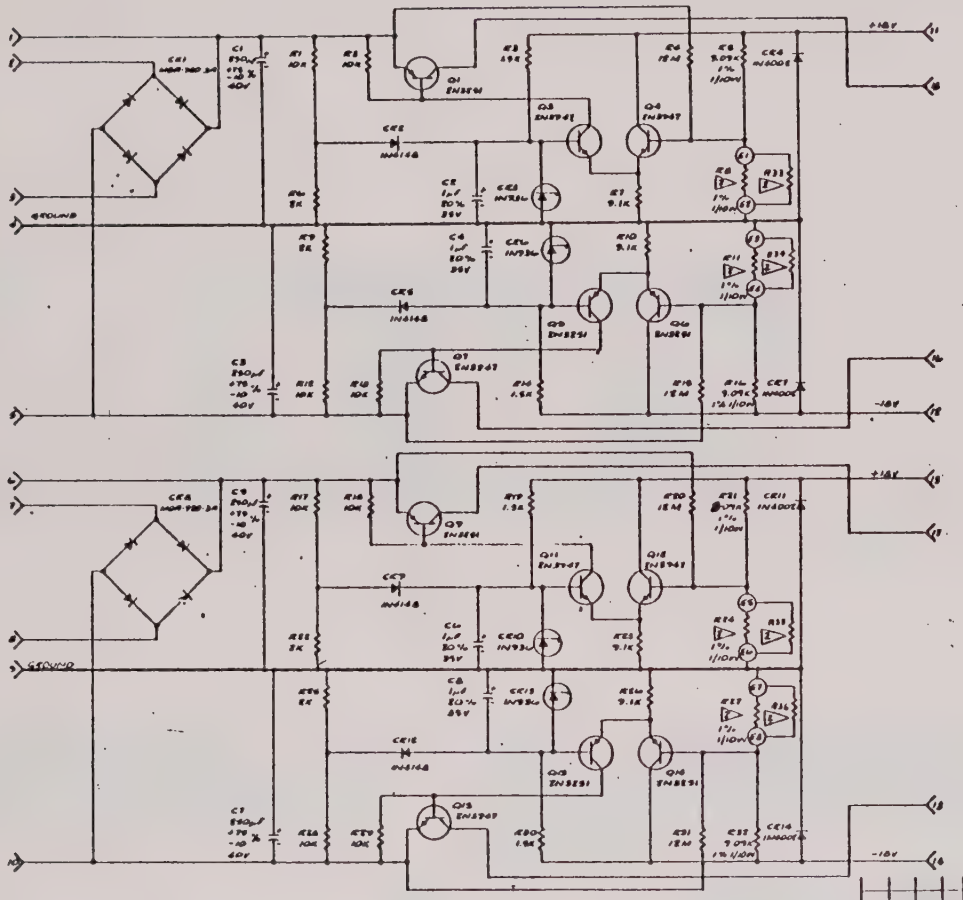
PRINTED-WIRING ASSEMBLY
REGULATOR

EDC

CODE IDENT NO	SIZE		REV
06141	C	15799	
SCALE 2/1	205-89-00494	SHEET 1 OF 1	

15799 1

EMR 3/2 174 OZALID



NOTES

1. ALL RESISTOR VALUES ARE IN OHMS (K=1000, M=1,000,000) AND ARE 5% 1/4W UNLESS NOTED.

⟨I⟩ TEST VARIABLE

REV	DESCRIPTION	DATE	APPROVED
A	ECO 33107	11-15	

ITEM	PART NO	DESCRIPTION	PART OR STOCK	QTY PER ASSY	ITEM OR SYMBOL
REQUIRED					

LIST OF MATERIALS

R16		
C8		
Q16		
CR14		
C8		
NO PART NUMBER	DO NOT USED	
COMPONENT CHART		

BSC	15799	6530
LEVEL NO	NEXT ASSY NO	WIRE DIA

APPLICATION

LOCATE MYLARS AS SHOWN

UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

MATERIAL X

FINISH X

DESIGNED BY	William Salter	4-15-68
DRAWN BY	William Salter	4-15-68
CHECKED BY		
DESIGN ENGINEER		
PROJECT ENGINEER	Jim Norton	4-19-68
APPROVED		
APPROVED		

© EMRT, INC. 1968

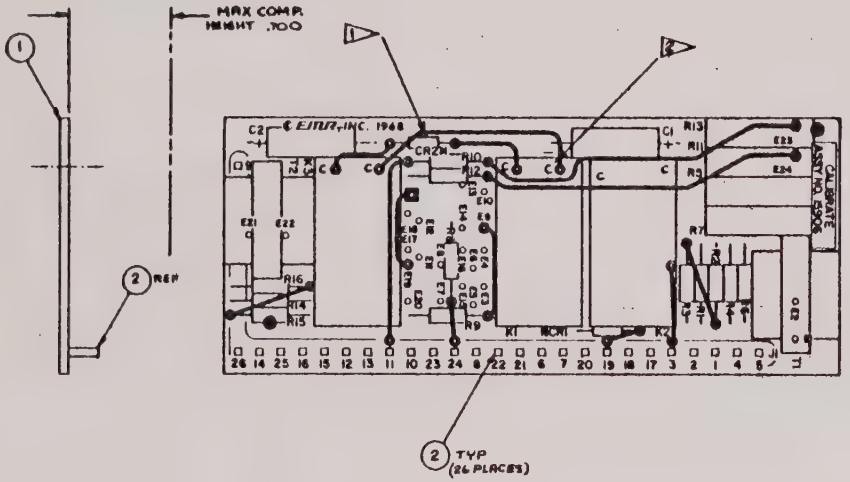
PRINTED-WIRING SCHEMATIC

REGULATOR

LAST MFG NO	REV	SIZE	DWG NO	REV
06141	D		15797	A
SCALE	925-01-00375		SHEET 1 OF 1	

11/18/68

REVISIONS				
SYM	DESCRIPTION	MANUAL APPLICATIVE	DATE	APPROVED



CONFIG.	JUMPERS (ITEM 3 AND 4)
15906	E3-E4, E5-E6, E7-E8, E18-E20
15906-1	E9-E10, E23-E24, E11-E12, E15-E16
15906-2	E9-E10, E23-E24, E11-E12, E15-E16, E21-E22
15908-3	E7-E8, E19-E20, E17-E18, E13-E14
15906-4	E7-E8, E19-E20, E17-E18, E13-E14, E1-E2, E21-E22

NOTES:

1. INSTALL JUMPER IN PLACE OF CR2 ON -1 & -2 CONFIGURATIONS.
2. C- DENOTES COIL END OF RELAY.

-4	-3	2	1	BASIC	DWG B-SIZE	PART NO	DESCRIPTION	PART CLASS	MFR CODE	ITEM OR SYMBOL
X	X				A	205-89-00499	FOR PARTS LIST SEE P/L - 15906-4			
X		X			A	205-89-00498	FOR PARTS LIST SEE P/L - 15906-3			
	X	X			A	205-89-00497	FOR PARTS LIST SEE P/L - 15906-2			
		X	X		A	205-89-00496	FOR PARTS LIST SEE P/L - 15906-1			
				X	A	205-89-00495	FOR PARTS LIST SEE P/L 15906			

REQUIRED

LIST OF MATERIALS

DASH NO	ASSY NO	USED ON
-4	41991	4530
-3	41991	4530
-2	41991	4530
-1	41991	4530
BSC	41991	4530

APPLICATION

DO NOT APPLY PART NO. PER

LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

MATERIAL

TREATMENT OR FINISH

		DATE
DRAWN BY		8/2/68
DESIGNER		8-2-68
CHECKER		8-12-68
DESIGN ENGINEER		
PROJECT ENGINEER		8/12/68
APPROVED		
APPROVED		

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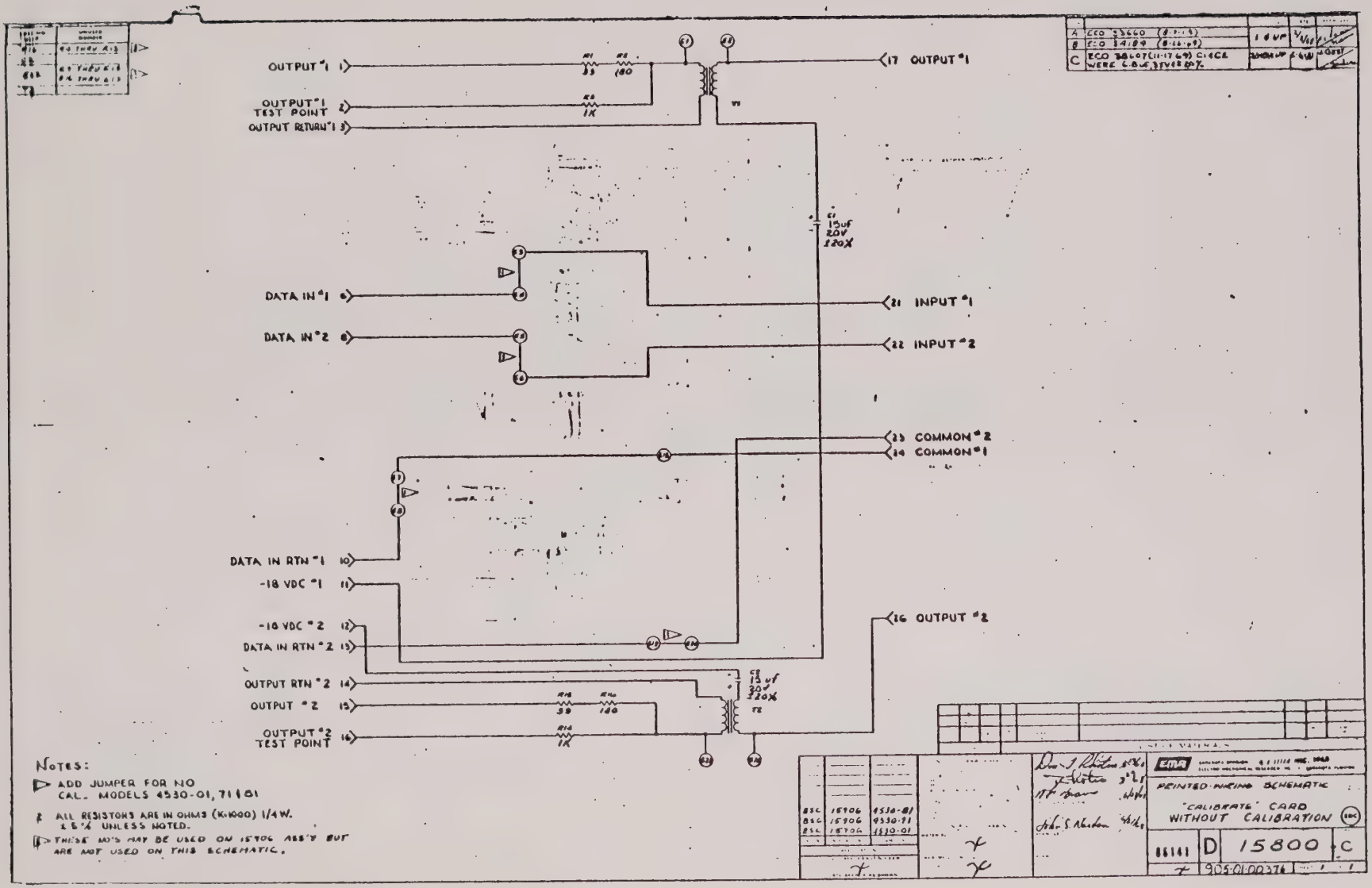
PRINTED-WIRING ASSEMBLY
CALIBRATE

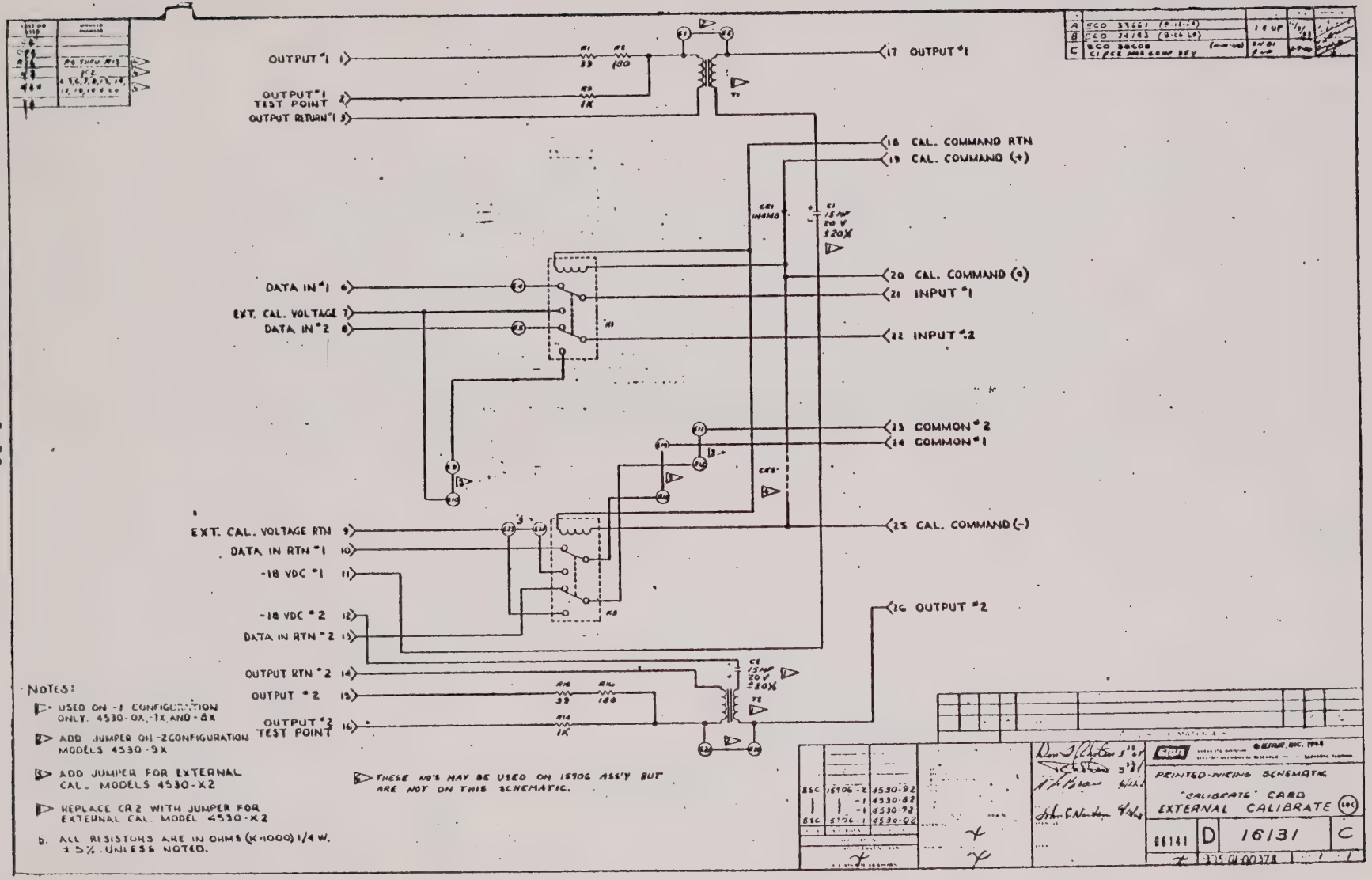
EDC

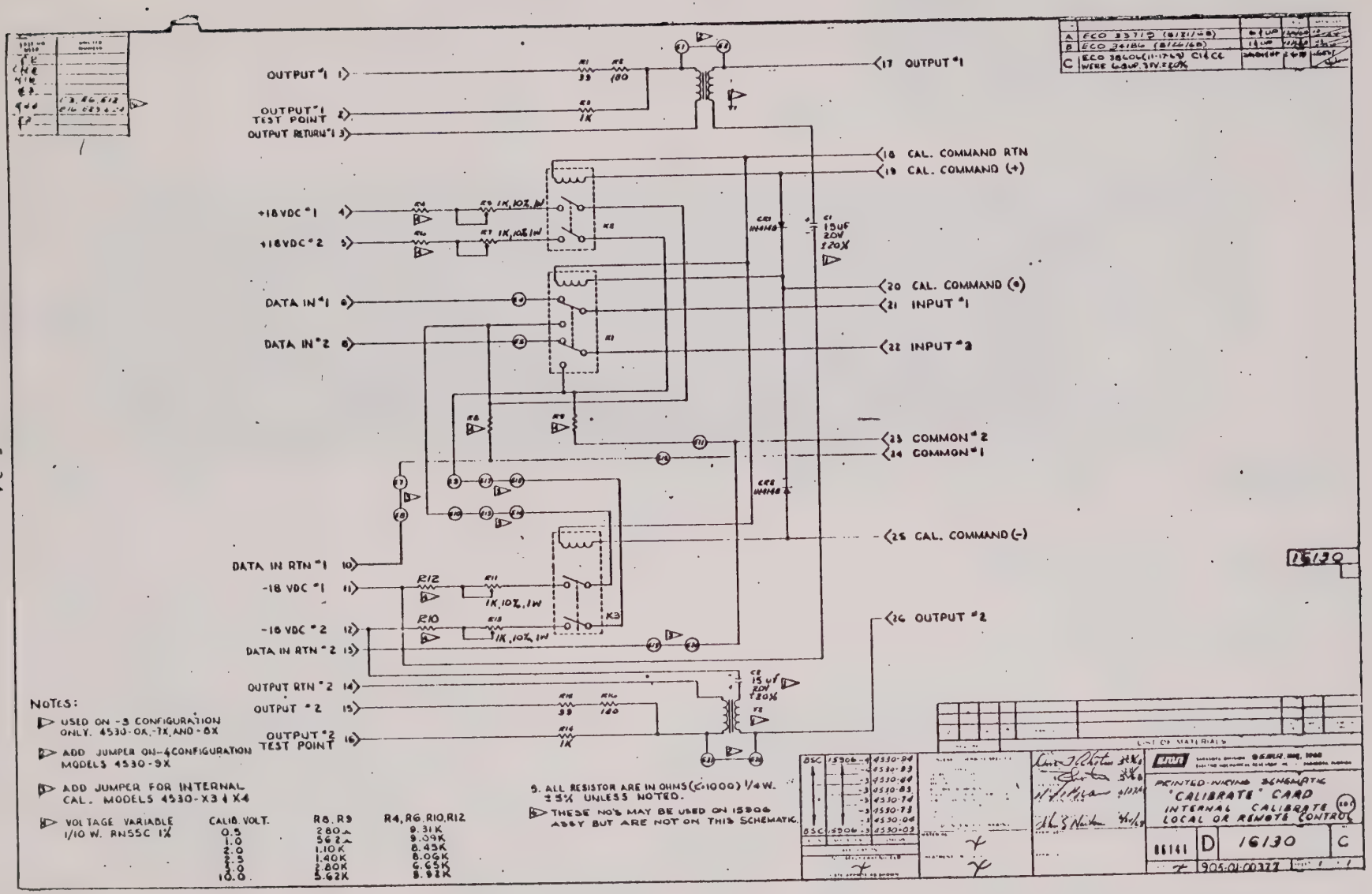
CODE IDENT NO	SIZE		REV
06141	C	15906	
SCALE 2/1	205-89-00495	SHEET 1 OF	

15906

EMR 3 3 174 OZALID


OUTPUT *1 1
OUTPUT *1 TEST POINT 2
OUTPUT RETURN *1 3
17 OUTPUT *1
DATA IN *1 6
DATA IN *2 8
21 INPUT *1
22 INPUT *2
23 COMMON *2
24 COMMON *1
DATA IN RTN *1 10
-18 VDC *1 11
-18 VDC *2 12
DATA IN RTN *2 13
26 OUTPUT *2
OUTPUT RTN *2 14
OUTPUT *2 15
OUTPUT *2 TEST POINT 16
C1 15uf 20V ±20%
C2 15 uf 20V ±20%
R1 33
R2 180
R3 1K
R4 33
R5 180
R6 1K
T1
T2
NOTES:
ADD JUMPER FOR NO CAL. MODELS 4530-01, 71 & 81
ALL RESISTORS ARE IN OHMS (K=1000) 1/4W. ±5% UNLESS NOTED.
THESE NO'S MAY BE USED ON 15706 ASS'Y BUT ARE NOT USED ON THIS SCHEMATIC.
A ECO 25660
B ECO 24189
C ECO 28107 (11-17-69) CHECK WERE C8 & C9 15 VS 33 MF.
PRINTED-WIRING SCHEMATIC
"CALIBRATE" CARD WITHOUT CALIBRATION
88141 D 15800 C
7 905-01-00376


OUTPUT #1 1
OUTPUT #1 TEST POINT 2
OUTPUT RETURN #1 3
DATA IN #1 6
EXT. CAL. VOLTAGE 7
DATA IN #2 8
EXT. CAL. VOLTAGE RTN 9
DATA IN RTN #1 10
-18 VDC #1 11
-18 VDC #2 12
DATA IN RTN #2 13
OUTPUT RTN #2 14
OUTPUT #2 15
OUTPUT #2 TEST POINT 16
17 OUTPUT #1
18 CAL. COMMAND RTN
19 CAL. COMMAND (+)
20 CAL. COMMAND (0)
21 INPUT #1
22 INPUT #2
23 COMMON #2
24 COMMON #1
25 CAL. COMMAND (-)
26 OUTPUT #2
33
100
1K
CR1 IN4148
C1 15 mF 20 V ±20%
K1
K2
K3
T1
CR2
NOTES:
1. USED ON -1 CONFIGURATION ONLY. 4530-0X, -1X AND -8X
2. ADD JUMPER ON -2 CONFIGURATION MODELS 4530-9X
3. ADD JUMPER FOR EXTERNAL CAL. MODELS 4530-X2
4. REPLACE CR2 WITH JUMPER FOR EXTERNAL CAL. MODEL 4530-X2
5. ALL RESISTORS ARE IN OHMS (K=1000) 1/4 W. ±5% UNLESS NOTED.
THESE NO'S MAY BE USED ON 1590G ASS'Y BUT ARE NOT ON THIS SCHEMATIC.
A ECO 33661
B ECO 34183 (8-16-68)
C ECO 36608
1 & UP
PRINTED-WIRING SCHEMATIC
"CALIBRATE" CARD
EXTERNAL CALIBRATE
86141 D 16131 C



NOTES:

1. USED ON -3 CONFIGURATION ONLY. 4530-0X, -1X, AND -8X
2. ADD JUMPER ON -4 CONFIGURATION MODELS 4530-9X
3. ADD JUMPER FOR INTERNAL CAL. MODELS 4530-X3 & X4
4. VOLTAGE VARIABLE 1/10 W. RN55C 1%

CALIB. VOLT.	R8, R9	R4, R6, R10, R12
0.5	280Δ	9.31K
1.0	562Δ	9.09K
2.0	1.10K	8.45K
2.5	1.40K	8.06K
5.0	2.80K	6.65K
10.0	5.62K	8.98K

5. ALL RESISTOR ARE IN OHMS (≤1000) 1/4 W. ±5% UNLESS NOTED.
6. THESE NO'S MAY BE USED ON 15306 ASSY BUT ARE NOT ON THIS SCHEMATIC.

A	ECO 33712 (8/21/68)	B	
B	ECO 36186 (8/26/68)		
C	ECO 38606 (11-17-69) CIRCUIT WERE CHGD. PER ECO		

LIST OF MATERIALS

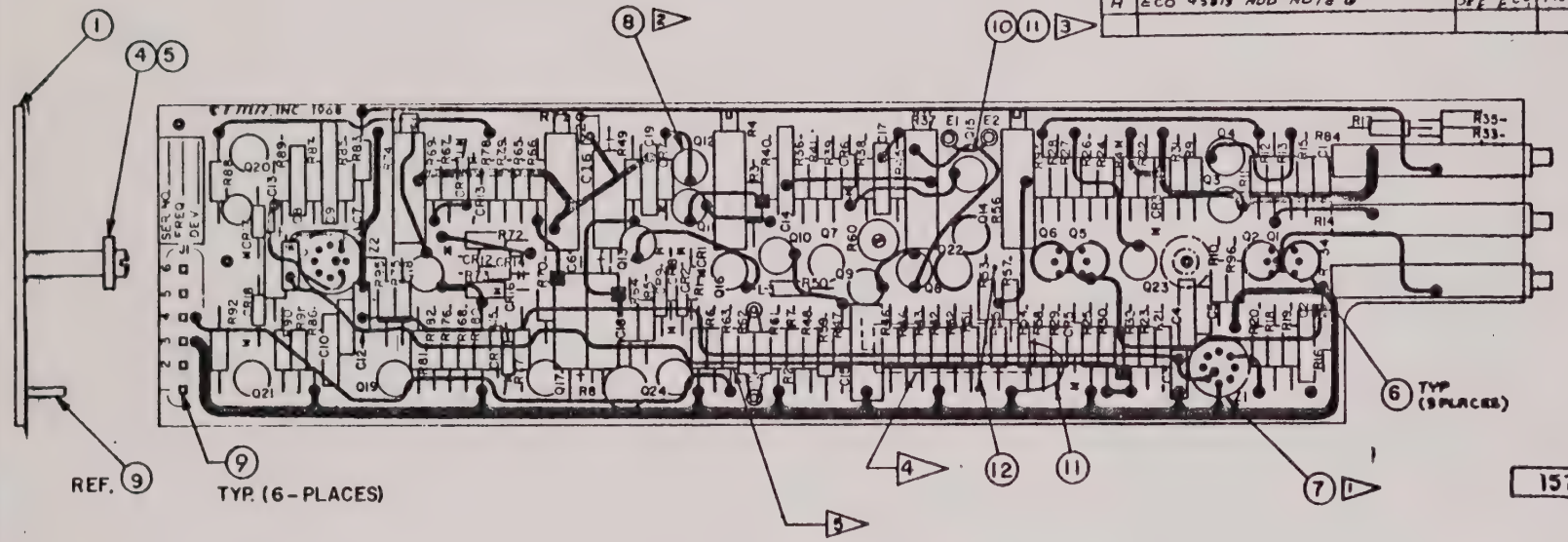
OSC 15306 -4	4530-04	
-3	4530-03	
-3	4530-04	
-3	4530-83	
-3	4530-74	
-3	4530-73	
-3	4530-04	
OSC 15306 -3	4530-03	

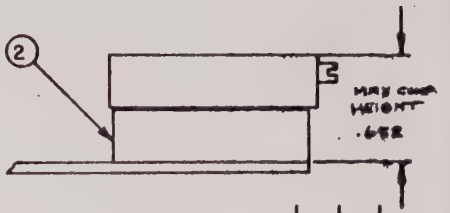
PRINTED WIRING SCHEMATIC
"CALIBRATE" CARD
INTERNAL CALIBRATE
LOCAL OR REMOTE CONTROL

88141	D	16130	C
	905-01-00377		

SYM	DESCRIPTION	EFFECTIVE	DATE	APPROVED
J	ECO 50790 INTERIM		10-31-74	
K	ECO 50793 ADDED C20		11-4-74	

SYM	DESCRIPTION	EFFECTIVE	DATE	APPROVED
A	ECO S/N 33693 (INTERIM 11-5-68)	SEE ECO	11-5-68	
B	ECO S/N 35226 (11-5-68)	SEE ECO		
C	ECO 35915 (1-27-69) INTERIM	SEE ECO	4-12-69	
D	ECO 36530 (3-27-69)	1 UP	6-11-69	
E	ECO 38233 (10-6-69) ADDED NOTE 5, ITEMS 11 & 12 AT NOTE 3 IN F/D	14 UP	3-11-70	
F	RCD CHG ADD ARROW AT C12	N/A	4-19-71	
G	ECO 44489 ADD 5 IN F/D (NOTES	3-28-72	3-27-72	
H	ECO 45813 ADD NOTE 6	SEE ECO	9-19-72	





NOTES:

1. FOR USE WITH E1 AND E2.
2. FOR USE WITH ALL TRANSISTORS.
3. JUMPER MAY BE REMOVED FOR UNITS ABOVE 50 KHz.
4. DASHED OUTLINE IS ALTERNATE POSITION FOR C15 WHEN THE CASE SIZE WILL NOT PERMIT MOUNTING IN STD POSITION. USE ITEMS 11 & 12 AS REQ'D.
5. R63 IS NON STD SPACING AND MUST BE SPACED .062 MIN. OFF PWB. USE HELICAL LEAD BENDS.
6. ALL COMPONENTS SHALL BE INSTALLED AND THE PWA SHALL BE AGED IN ACCORDANCE WITH DRAWING 11243. IN CASE OF COMPONENT FAILURE, ONLY THE FOLLOWING COMPONENTS MUST BE REPLACED WITH PARTS AGED ACCORDING TO DWG 11243; Q5, 4, 7, 8, 9, 14, 15, 22, 24, CR1, 2, 8, 9 & C15.

-2	-1	BASIC	DWG SIZE	PART NO.	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR SYMBOL
		X	A	205-88-00406	FOR PARTS LIST SEE P/L 15796			

REQUIRED

LIST OF MATERIALS

DASH NO	PART ASSY NO	USED ON
BSC	14891	4530

APPLICATION

DO NOT APPLY PART NO. TEN

LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED

TOLERANCES — SURFACE FINISH

DECIMALS ANGLES

ALL DIMENSIONS ARE IN INCHES

THREADS CLASS 2A OR 2B PER ANSI B1.1-1968

REMOVE BURRS AND BREAK SHARP EDGES

HOLE TOLERANCES PER MIL-STD-1312

DIMENSIONS INCLUSIVE APPLIED FINISH

USE AMERICAN NATIONAL STANDARDS WHERE APPLICABLE

DO NOT SCALE DRAWING

MATERIAL

TREATMENT OR FINISH

		DATE
DRAWN BY	Jim Graham	9-12-68
DESIGNER	E. Burke	9-12-68
CHECKED	[illegible]	9-16-68
DESIGN ENGINEER		
PROJECT ENGINEER	Thos S. Nardone	9/16/68
APPROVED		
APPROVED		

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PRINTED-WIRING ASSEMBLY

VCO

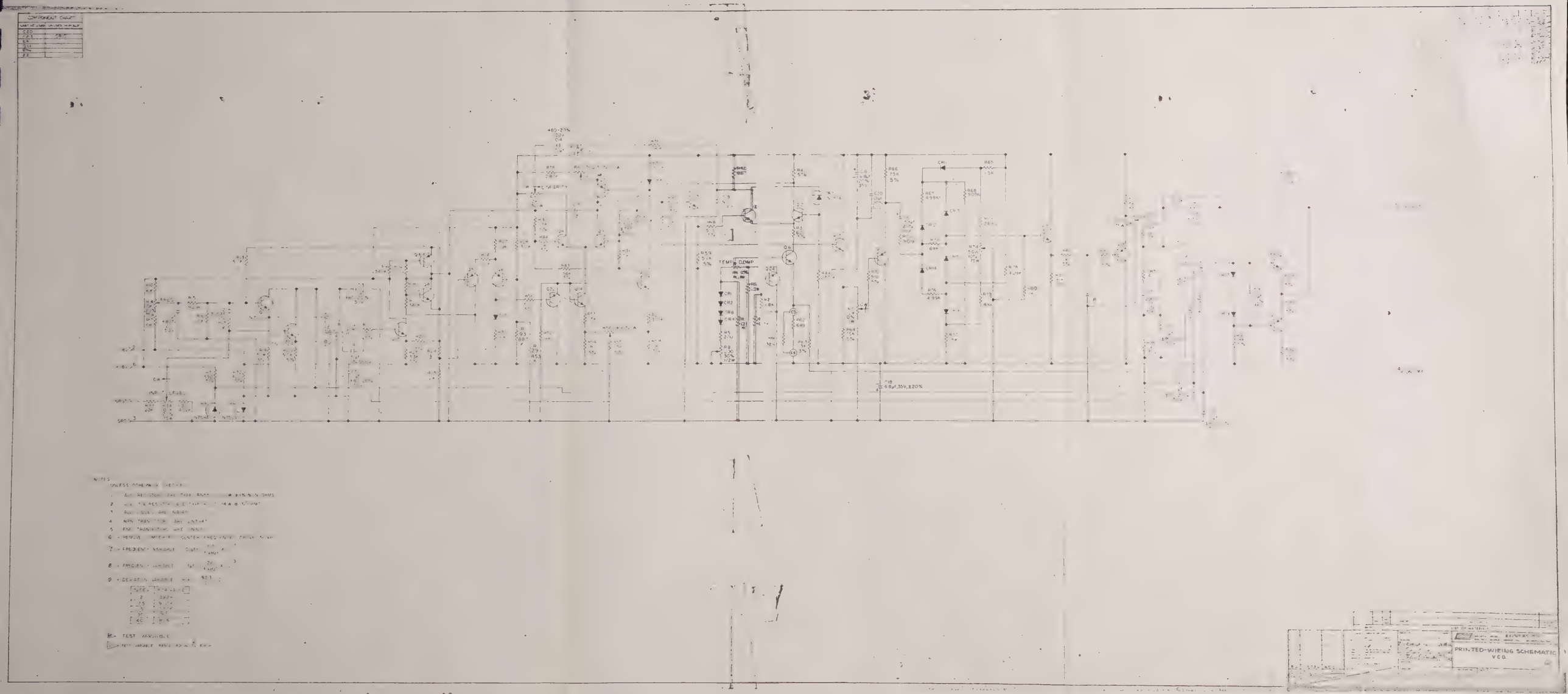
CODE IDENT NO.	SIZE		REV
06141	C	15796	K

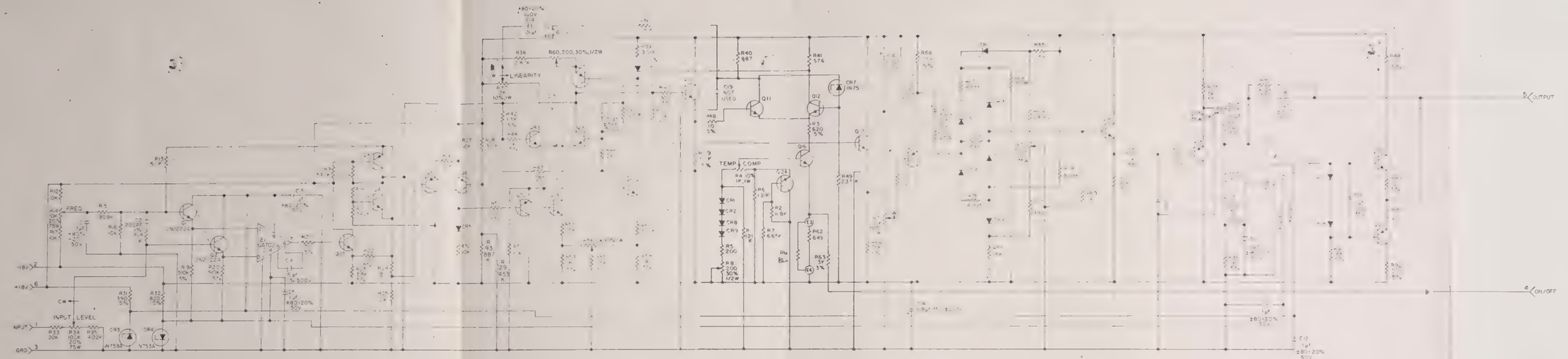
SCALE 2/1 | 205-88-00406 | SHEET 1 OF 1

15796

5-25

MR3 2 174 MYLALID C3


COMPONENT CHART
TEMP COMP
INP. LEVEL
R66 7.5K 5%
R65 5K
R67 499K
R68 301K
R74 604Ω 1%
R73 4MΩ
R72 4.99K
R64 7.5K
R59 5.1K 5%
R8 50% 1/2W
C18 6.8µf,35V,±20%
PRINTED-WIRING SCHEMATIC
V.C.O.



NOTES:

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ARE TYPE RN55D, 1/10W ±1% IN OHMS
2. ALL CAPACITORS ARE TYPE CK05BX IN MFD
3. ALL DIODES ARE 1N914
4. NPN TRANSISTORS ARE 2N4124
5. PNP TRANSISTORS ARE 2N4126
6. REMOVE JUMPER FOR CENTER FREQUENCY CHOICE OF 1 MHz
7. = FREQUENCY VARIABLE CAPACITOR 7 (15MHz) X 3
8. = FREQUENCY VARIABLE CAPACITOR 22 (15MHz) X 1
9. = DEVIATION VARIABLE POT 83.1

%DEV	R24 ADJUST
2	19.2K
7.5	5.49K
15	2.87K
30	1.8K
40	806

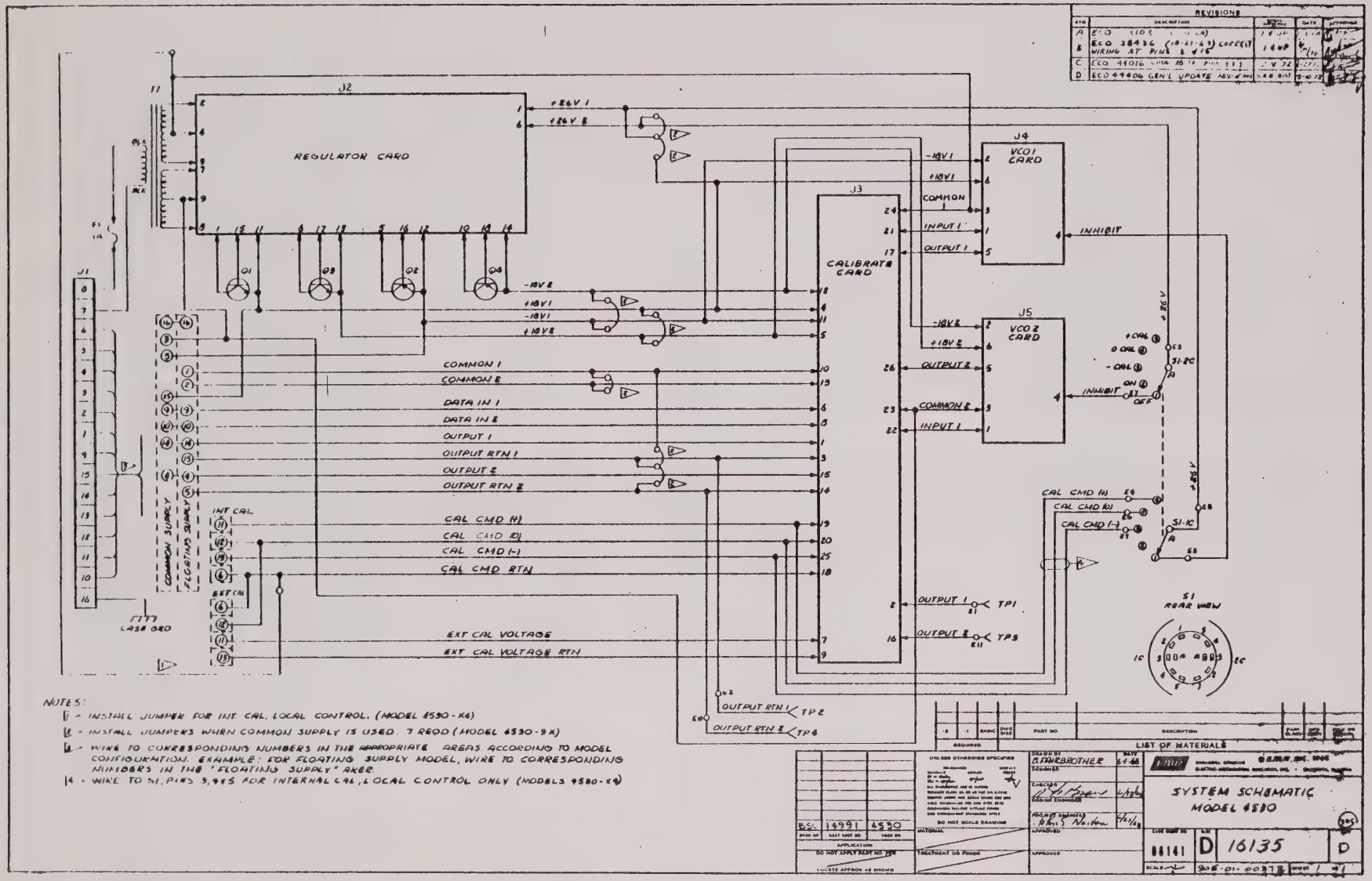
= TEST VARIABLE

= TEST VARIABLE RANGE WITH TRIMPOT

EATON INC 1968

PRINTED-WIRING SCHEMATIC
V.C.O.

15794


REVISIONS
REGULATOR CARD
J2
J1
J3
CALIBRATOR CARD
J4
VCO1 CARD
J5
VCO2 CARD
+26V 1
+26V 2
-18V 1
+18V 1
COMMON 1
INPUT 1
OUTPUT 1
INHIBIT
-18V 2
+18V 2
COMMON 2
OUTPUT 2
INPUT 2
Q1
Q3
Q2
Q4
COMMON 1
COMMON 2
DATA IN 1
DATA IN 2
OUTPUT 1
OUTPUT RTN 1
OUTPUT 2
OUTPUT RTN 2
INT CAL
CAL CMD (+)
CAL CMD (0)
CAL CMD (-)
CAL CMD RTN
EXT CAL
EXT CAL VOLTAGE
EXT CAL VOLTAGE RTN
COMMON SUPPLY
FLOATING SUPPLY
CASE GRD
+CAL
0 CAL
-CAL
ON
OFF
S1-EC
S1-IC
S1
REAR VIEW
TP1
TP3
TP2
TP4
NOTES:
1. INSTALL JUMPER FOR INT. CAL, LOCAL CONTROL. (MODEL 4530-X6)
2. INSTALL JUMPERS WHEN COMMON SUPPLY IS USED. 7 REQD (MODEL 4530-9X)
3. WIRE TO CORRESPONDING NUMBERS IN THE APPROPRIATE AREAS ACCORDING TO MODEL CONFIGURATION. EXAMPLE: FOR FLOATING SUPPLY MODEL, WIRE TO CORRESPONDING NUMBERS IN THE "FLOATING SUPPLY" AREA.
4. WIRE TO S1, PINS 3, 9 & 5 FOR INTERNAL CAL, LOCAL CONTROL ONLY (MODELS 4530-X4)
LIST OF MATERIALS
SYSTEM SCHEMATIC
MODEL 4510
88141
D
16135
4530
14991

SECTION 6

PARTS LIST AND RECOMMENDED SPARES

6.1 GENERAL

This section contains information concerning parts replacement, spares provisioning, and parts ordering for the EMR 4530. A complete list of the parts information is contained in Table 6-1 and described in paragraph 6.2. Recommended spares, spares provisioning information, and parts ordering information are contained in paragraphs 6.3, 6.4, and 6.5, respectively.

6.2 PARTS LIST DESCRIPTION

6.2.1 Variable Chart

The variable chart, EMR drawing 14993, contains the top level parts information for the 4530. This drawing provides the complete model number of the unit and information describing the variable digits of the model number. The tables on the top of the model number illustrate all available versions of the 4530 and the corresponding model numbers. The lower left table under the model number contains EMR parts list numbers and part numbers for the various models. Knob, handle, and trim parts information is contained in the lower right table under the model number.

6.2.2 Parts List

The parts lists in this section are provided in descending order starting with the top assembly parts lists and continuing through all subassemblies and components. A complete tabulation of the parts lists and the order in which they appear in this section are contained in Table 6-1. Table 6-1 also contains the parts list number, used on information, and the page number on which each parts list starts.

Each parts list number corresponds to the assembly number and drawing number in which the parts are illustrated. Drawings illustrating the parts in the parts lists are contained in Section 5 of this manual. For example, the parts listed in PL-14991 are illustrated on EMR drawing 14991 in Section 5. Certain assemblies and subassemblies contain dash (-) configurations of the assembly, e.g., PL-14991-1. Dash numbers are used to identify different configurations of the same assembly. However, all parts listed on PL-14991, 14991-1, etc., are illustrated on EMR drawing 14991.

The parts list for each top assembly (14991, 14991-1, etc.) contains a listing of all subassemblies in the configuration. The subassemblies are identified by an item number in the ITEM NO. column. These item numbers correspond to numbers in the reference balloons on the top assembly drawing 14991.

The subassemblies are broken down in separate parts lists. Parts lists for the subassemblies are identified by the subassembly number in the DRAWING OR SPEC NO. column. Further parts list breakdown from this point is in the same manner.

Also included in the parts lists for each item is the quantity required (QTY. REQ'D.), EMR PART NUMBER, DESCRIPTION, VENDOR NAME, and VENDOR PART NUMBER. The listings in the VENDOR NAME column are abbreviations for the particular vendors. These abbreviations and complete vendor identification are contained in Table 6-3. Any part listed in the parts lists may be ordered directly from EMR or may be purchased from the original vendor.

6.3 RECOMMENDED SPARES

A list of the recommended spare parts for the 4530 is contained in Table 6-2. The recommended spares, as listed in this Table, are based on the following conditions:

a. Operating time -- 8 hours/day, 5 days/week (2080 hours/year).

b. Operating temperature -- $0^{\circ}C$ to $30^{\circ}C$.

c. User has capability to repair to the component level.

d. Failure rates are constant.

e. A 0.9 probability of being able to repair from the recommended complement for one year.

f. Equipment will be used as ground equipment (as opposed to vehicular or airborne).

The recommended spares table contains a PART DESCRIPTION column, an EMR STOCK NO. column, a VENDOR NAME column, a VENDOR PART NO. column, a TQ column which is the total quantity of the part in the unit, and an RS column which lists the number of recommended spares for the part. The listings in the VENDOR NAME column are abbreviations for the particular vendors. These abbreviations and complete vendor identification are described in Table 6-3.

6.4 PROVISIONING CONSIDERATIONS

The selection of an optimum spare parts complement involves a number of considerations known only to the user. These considerations include operating

time and cycles, operating environment, number of equipments to be spared and their locations with respect to one another, urgency of returning an equipment to service, troubleshooting, repair and test capability, stock of commonly used parts, etc.

Sparing considerations known to EMR include mean-time-between-failures for parts and assemblies under various operating environments, prices, relative ease of troubleshooting, repair, retest, etc.

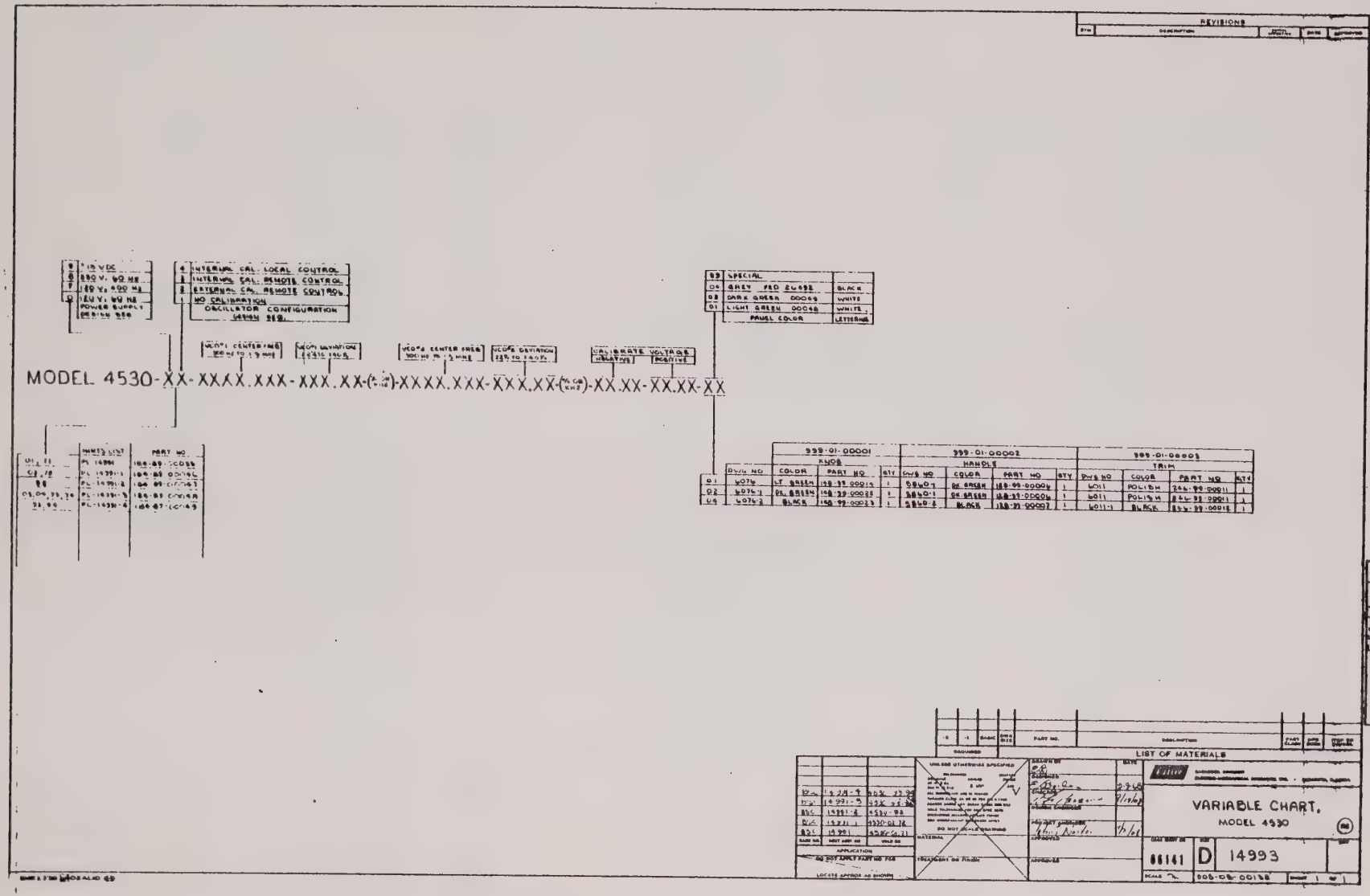
Table 6-4 lists the type of information required in order for EMR to recommend an optimum spare parts complement for specific operating and logistic situations. If the information outlined in Table 6-4 is supplied to EMR, a recommended list will be furnished at no cost for each individual situation.

6.5 ORDERING INSTRUCTIONS

When ordering parts, complete description of each part as listed in DESCRIPTION column of parts list must accompany order. Also included, must be the EMR stock number and vendor's name and part number.

Table 6-1. Parts List Breakdown

NAME	NUMBER	USED ON	PAGE
MODEL 4530 VARIABLE CHART	14993	ALL MODELS	--
OSCILLATOR ASSEMBLY	PL-14991	4530-01 and -71	6-6
OSCILLATOR ASSEMBLY	PL-14991-1	4530-02 and -72	6-7
OSCILLATOR ASSEMBLY	PL-14991-2	4530-92	6-8
OSCILLATOR ASSEMBLY	PL-14991-3	4530-03, -04, -73, and -74	6-9
OSCILLATOR ASSEMBLY	PL-14991-4	4530-93 and -94	6-10
CHASSIS ASSEMBLY	PL-14992	ALL MODELS EXCEPT 4530-92, -93, and -94	6-11
CHASSIS ASSEMBLY	PL-14992-1	4530-92, -93, and -94	6-13
FRONT PANEL ASSEMBLY	PL-14990	ALL MODELS	6-14
POWER SUPPLY REGULATOR CARD	PL-15799	ALL MODELS EXCEPT 4530-9X SERIES	6-15
CALIBRATE CARD	PL-15906	4530-01 and -71	6-19
CALIBRATE CARD	PL-15906-1	4530-02 and -72	6-20
CALIBRATE CARD	PL-15906-2	4530-92	6-21
CALIBRATE CARD	PL-15906-3	4530-03, -04, -73, and -74	6-22
CALIBRATE CARD	PL-15906-4	4530-93 and -94	6-24
VCO CARD	PL-15796	ALL MODELS	6-26


REVISIONS
MODEL 4530-XX-XXXX.XXX-XXX.XX-(%)-XXXX.XXX-XXX.XX-(%)-XX.XX-XX.XX-XX
LIST OF MATERIALS
VARIABLE CHART,
MODEL 4530
14993
D

EMR - TELEMETRY

PARTS LIST 14991 REV DATE 09/20/68 REV LTR D

LIST TITLE OSC,ASSY
PART NO. 184-89-00035

CHGE CONT NO. CODE IDENT SHT 1 OF
ECO 34577 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00090	14992	CHAS,ASSY	SPEC	14992
2	1	191-89-00246	14990	PANEL,ASSY	SPEC	14990
3	1	999-01-00001	14993	KNOB,POA VAR		
4	1	999-01-00002	14993	HANDLE,POA VAR		
5	1	075-89-00012	6650	COVER,ASSY	SPEC	6650
6	1	205-89-00494	15799	PWA,POWER SUPPLY REG	SPEC	15799
7	1	205-89-00495	15906	PWA,CALIBRATE CARD NO CAL	SPEC	15906
8	2	205-89-00406	15796	PWA,VCO	SPEC	15796
10	1	127-98-00008		GROM	HARTWELL	H559-4-1
11	2	267-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
12	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
13	2	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
14	2	229-02-00072		SCREW,4-40X3/16 PAN HD	QVL	MS51957-12
15	A/R	060-11-00001		COMP, LOCTITE, GRADE D	AMER SEALANT	BY DESCRIPTION
16	6	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
17	2	273-98-00011		WASHER,#4, FIBER	H H SMITH	2161
18	2	229-02-00074		SCREW,4-40X5/16 PAN HD	QVL	MS51957-14
REF1	1	903-01-00372	16135	SCHEMATIC	SPEC	16135
REF2	1	903-05-00138	14993	VARIABLE CHART	SPEC	14993
REF3	1	903-07-00081	15777	SPEC,PRODUCT	SPEC	15777
REF4	1	903-06-00038	15778	SPEC,SETUP	SPEC	15778

FIRST USAGE MODEL 4530-016-71

EMR - TELEMETRY

PARTS LIST 14991-1 REV DATE REV LTR

LIST TITLE OSC,ASSY
PART NO. 164-89-00046

CHGE CONT NO. ECO
CODE IDENT 06141
SHT 1 OF
CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00090	14992	CHAS,ASSY	SPEC	14992
2	1	191-89-00246	14990	PANEL,ASSY	SPEC	14990
3	1	999-01-00001	14993	KNOB,POA VAR		
4	1	999-01-00002	14993	HANDLE,POA VAR		
5	1	075-89-00012	6650	COVER,ASSY	SPEC	6650
6	1	205-89-00494	15799	PWA,POWER SUPPLY REG	SPEC	15799
7	1	205-89-00496	15906-1	PWA,CALIBRATE CARD EXT CA	SPEC	15906-1
8	2	205-89-00406	15796	PWA,VCO	SPEC	15796
10	1	127-98-00008		GROM	HARTWELL	H559-4-1
11	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
12	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
13	2	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
14	2	229-02-00072		SCREW,4-40X3/16 PAN HD	QVL	MS51957-12
15	A/R	060-11-00001		COMP, LOCTITE, GRADE D	AMER SEALANT	BY DESCRIPTION
16	6	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
17	2	273-98-00011		WASHER,#4, FIBER	H H SMITH	2161
18	2	229-02-00074		SCREW,4-40X5/16 PAN HD	QVL	MS51957-14
REF1	1	905-01-00372	16135	SCHEMATIC	SPEC	16135
REF2	1	905-05-00138	14993	VARIABLE CHART	SPEC	14993
REF3	1	905-07-00081	15777	SPEC,PRODUCT	SPEC	15777
REF4	1	905-06-00038	15778	SPEC,SETUP	SPEC	15778

FIRST USAGE MODEL 4530-02672

EMR - TELEMETRY

PARTS LIST 14991-2 REV DATE REV LTR

LIST TITLE OSC,ASSY CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 194-89-00047 ECO 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00110	14992-1	CHAS,ASSY	SPEC	14992-1
2	1	191-89-00246	14990	PANEL,ASSY	SPEC	14990
3	1	999-01-00001	14993	KNOB,POA VAR		
4	1	999-01-00002	14993	HANDLE,POA VAR		
5	1	075-89-00012	6650	COVER,ASSY	SPEC	6650
7	1	205-89-00497	15906-2	PWA,CALIBRATE CARD EXT CA	SPEC	15906-2
8	2	205-89-00406	15796	PWA,VCO	SPEC	15796
10	1	127-98-00008		GROM	HARTWELL	H559-4-1
11	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
12	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
13	2	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
14	2	229-02-00072		SCREW,4-40X3/16 PAN HD	QVL	MS51957-12
15	A/R	060-11-00001		COMP, LOCTITE, GRADE D	AMER SEALANT	BY DESCRIPTION
16	6	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
REF1	1	905-01-00372	16135	SCHEMATIC	SPEC	16135
REF2	1	905-05-00138	14993	VARIABLE CHART	SPEC	14993
REF3	1	905-07-00081	15777	SPEC,PRODUCT	SPEC	15777
REF4	1	905-06-00038	15778	SPEC,SETUP	SPEC	15778

FIRST USAGE MODEL 4530-92

EMR - TELEMETRY

PARTS LIST 14991-3 REV DATE REV LTR

LIST TITLE OSC,ASSY CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 104-89-00048 ECO 06141 CKD BY

ITEM NO.	QTY REQD	F M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00090	14992	CHAS,ASSY	SPEC	14992
2	1	191-89-00246	14990	PANEL,ASSY	SPEC	14990
3	1	999-01-00001	14993	KNOB,POA VAR		
4	1	999-01-00002	14993	HANDLE,POA VAR		
5	1	075-89-00012	6650	COVER,ASSY	SPEC	6650
6	1	205-89-00494	15799	PWA,POWER SUPPLY REG	SPEC	15799
7	1	205-89-00498	15906-3	PWA,CALIBRATE CARD INT CA	SPEC	15906-3
8	2	205-89-00406	15796	PWA,VCO	SPEC	15796
10	1	127-98-00008		GROM	HARTWELL	H559-4-1
11	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
12	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
13	2	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
14	2	229-02-00072		SCREW,4-40X3/16 PAN HD	QVL	MS51957-12
15	A/R	060-11-00001		COMP, LOCTITE, GRADE D	AMER SEALANT	BY DESCRIPTION
16	6	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
17	2	273-98-00011		WASHER,#4, FIBER	H H SMITH	2161
18	2	229-02-00074		SCREW,4-40X5/16 PAN HD	QVL	MS51957-14
REF1	1	905-01-00372	16135	SCHEMATIC	SPEC	16135
REF2	1	905-05-00138	14993	VARIABLE CHART	SPEC	14993
REF3	1	905-07-00081	15777	SPEC,PRODUCT	SPEC	15777
REF4	1	905-06-00038	15778	SPEC,SETUP	SPEC	15778

FIRST USAGE MODEL 4530,03,04,73674

EMR - TELEMETRY

PARTS LIST 14991-4 REV DATE REV LTR

LIST TITLE OSC,ASSY
PART NO. 184-89-00049 CHGE CONT NO. ECO CODE IDENT 06141 SHT 1 OF CKD BY

ITEM NO.	QTY REQD	E.M.R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00118	14992-1	CHAS,ASSY	SPEC	14992-1
2	1	191-89-00246	14990	PANEL,ASSY	SPEC	14990
3	1	999-01-00001	14993	KNOB,POA VAR		
4	1	999-01-00002	14993	HANDLE,POA VAR		
5	1	075-89-00012	6650	COVER,ASSY	SPEC	6650
7	1	205-89-00499	15906-4	PWA,CALIBRATE CARD INT CA	SPEC	15906-4
8	2	205-89-00406	15796	PWA,VCO	SPEC	15796
10	1	127-98-00008		GROM	HARTWELL	H559-4-1
11	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
12	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
13	2	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
14	2	229-02-00072		SCREW,4-40X3/16 PAN HD	QVL	MS51957-12
15	A/R	060-11-00001		COMP, LOCTITE, GRADE D	AMER SEALANT	BY DESCRIPTION
16	6	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
REF1	1	905-01-00372	16135	SCHEMATIC	SPEC	16135
REF2	1	905-05-00138	14993	VARIABLE CHART	SPEC	14993
REF3	1	905-07-00081	15777	SPEC,PRODUCT	SPEC	15777
REF4	1	905-06-00038	15778	SPEC,SETUP	SPEC	15778

FIRST USAGE MODEL 4530-93694

PARTS LIST 14992 REV DATE 08/30/68 REV LTR C

LIST TITLE CHAS,ASSY CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 042-89-00090 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00092	15723	CHAS,ASSY,WELDMENT	SPEC	15723
2	1	205-89-00500	15908	PWA,INTERCONNECT CARD	SPEC	15908
3	1	134-98-00016		HOLDER,FUSE	LITTLEFUSE	281002
4	1	120-98-00038	273001	FUSE,MICRO,1 AMP 125V	LITTELFUSE	273001
5	1	063-98-00042		CONN,PLUG,16PIN,R&P	AMPHENOL	26-159-16
6	1	262-99-00067	15893	XFMR	SPEC	15893
7	4	229-02-00106		SCREW,8-32X7/8 PAN HD	QVL	MS51957-48
8	10	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
9	8	273-98-00036		WASHER,#8,FIBRE .168ID	SEASTROM	5602-82-093
10	8	273-98-00035		WASHER,#8,FIBRE .175ID	SEASTROM	5602-79-062
12	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
13	2	273-02-00025		WASHER,#4,INT TOOTH	QVL	MS35333-70
16	4	229-02-00186		SCREW,4-40X5/16,FLT HD	QVL	MS51959-14
17	4	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
18	4	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
19	A/R	268-98-00013		TUBING,3/4,SHRINK,BLK	ALPHLEX	PVC-105
20	1	255-02-00004		TERM.,LUG,SOLDER,#8,LOCK	QVL	MS77070-3
21	4	273-02-00008		WASHER,#8, FLT ST STL	QVL	MS15795-807
22	4	273-02-00021		WASHER,#8,EXT TOOTH	QVL	MS35335-59
23	1	250-98-00045		SWITCH,ROT.,2P,2-5POS,NS	ALCO	MRA-2-5S
24	1	255-98-00048		TERM, SOLDER LUG, #4	BIRNBACK	193
41	1	283-10-49220		XSTR,NPN,SW AMPL 60V,1A	JEDEC	2N4922

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
Q2	1	263-10-49190		XSTR,PNP,SW AMPL 60V,1A	JEDEC	2N4919
Q3	1	263-10-49220		XSTR,NPN,SW AMPL 60V,1A	JEDEC	2N4922
Q4	1	263-10-49190		XSTR,PNP,SW AMPL 60V,1A	JEDEC	2N4919

FIRST USAGE MODEL 4530

EMR - TELEMETRY

PARTS LIST 14992-1 REV DATE REV LTR

LIST TITLE CHAS,ASSY CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 042-89-00118 ECO 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00092	15723	CHAS,ASSY,WELDMENT	SPEC	15723
2	1	205-89-00500	15908	PWA,INTERCONNECT CARD	SPEC	15908
3	1	134-98-00016		HOLDER,FUSE	LITTLEFUSE	281002
4	1	120-98-00038	273001	FUSE,MICRO,1 AMP 125V	LITTELFUSE	273001
5	1	063-98-00042		CONN,PLUG,16PIN,RCP	AMPHENOL	26-159-16
8	10	229-02-00073		SCREW,4-40X1/4 PAN HD	QVL	MS51957-13
9	6	273-98-00036		WASHER,#8,FIBRE .188ID	SEASTROM	5602-82-093
10	6	273-98-00035		WASHER,#8,FIBRE .175ID	SEASTROM	5602-79-062
12	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
13	2	273-02-00025		WASHER,#4,INT TOOTH	QVL	MS35333-70
16	4	229-02-00186		SCREW,4-40X5/16,FLT HD	QVL	MS51959-14
17	4	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4
18	4	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4
19	A/R	268-98-00013		TUBING,3/4,SHRINK,BLK	ALPHLEX	PVC-105
23	1	250-98-00045		SWITCH,ROT.,2P,2-5POS,NS	ALCO	MRA-2-5S
24	1	255-98-00048		TERM, SOLDER LUG, #4	BIRNBACK	193
Q1	1	263-10-49220		XSTR,NPN,SW AMPL 60V,1A	JEDEC	2N4922
Q2	1	263-10-49190		XSTR,PNP,SW AMPL 60V,1A	JEDEC	2N4919
Q3	1	263-10-49220		XSTR,NPN,SW AMPL 60V,1A	JEDEC	2N4922
Q4	1	263-10-49190		XSTR,PNP,SW AMPL 60V,1A	JEDEC	2N4919

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EMR - TELEMETRY

PARTS LIST 14990 REV DATE REV LTR

LIST TITLE PANEL,ASSY
PART NO. 191-89-00246

CHGE CONT NO. CODE IDENT 06141 SHT 1 OF
ECO CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	191-89-00247	15717	PANEL,ASSY	SPEC	15717
2	1	999-04-00003	14993	STRIP,POA VAR		
3	2	412-99-00007	15718	IDENT,RET	SPEC	15718
4	1	016-99-00041	6012	BRKT, LOCATING	SPEC	6012
5	4	143-98-00006		JACK,TEST,WHITE	SEALECTRO	SKT-8-WHITE
6	2	229-02-00217		SCREW,0X3/16,RND HD	QVL	MS21318-8
7	7	229-02-00216		SCREW,00X3/16,RND HD	QVL	MS21318-2
REF1	1	905-10-00188	MYL-14990	ARTWORK,FRONT PANEL	SPEC	MYL-14990
REF2	1	905-05-00138	14993	VARIABLE CHART	SPEC	14993

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PARTS LIST 15799 REV DATE REV LTR A

LIST TITLE PWA,POWER SUPPLY REG CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-89-00494 ECO 33655 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-89-00191	15798	PWB,REG	SPEC	15798
2	18	065-98-00012		CONT,SOCKET	AMP	85861-4
3	12	189-98-00004		PAD,XSTR TO-18 4 PIN,.15	DEL BLINN	TP-100
C1	1	354-59-25005		CAP.,250MF -10&75% 40V	SPRAGUE	39D257G040GE4
C2	1	336-23-10003	601	CAP.,1.0MF 20% 35V	SPEC	601
C3	1	354-59-25005		CAP.,250MF -10&75% 40V	SPRAGUE	39D257G040GE4
C4	1	336-23-10003	601	CAP.,1.0MF 20% 35V	SPEC	601
C5	1	354-59-25005		CAP.,250MF -10&75% 40V	SPRAGUE	39D257G040GE4
C6	1	336-23-10003	601	CAP.,1.0MF 20% 35V	SPEC	601
C7	1	354-59-25005		CAP.,250MF -10&75% 40V	SPRAGUE	39D257G040GE4
C8	1	336-23-10003	601	CAP.,1.0MF 20% 35V	SPEC	601
CR1	1	214-98-00003		RECT,MDA920A-3	MOT	MDA920A-3
CR2	1	088-10-41480		DIODE	JEDEC	1N4148
CR3	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	JEDEC	1N936
CR4	1	088-10-40020		DIODE,RECTIFIER 100V,1A,I	JEDEC	1N4002
CR5	1	088-10-41480		DIODE	JEDEC	1N4148
CR6	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	JEDEC	1N936
CR7	1	088-10-40020		DIODE,RECTIFIER 100V,1A,I	JEDEC	1N4002
CR8	1	214-98-00003		RECT,MDA920A-3	MOT	MD4920A-3
CR9	1	088-10-41480		DIODE	JEDEC	1N4148
CR10	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	JEDEC	1N936
CR11	1	088-10-40020		DIODE,RECTIFIER 100V,1A,I	JEDEC	1N4002

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
CR12	1	088-10-41480		DIODE	JEDEC	1N4148
CR13	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	JEDEC	1N936
CR14	1	088-10-40020		DIODE,RECTIFIER 100V,1A,I	JEDEC	1N4002
Q1	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q3	1	263-10-39470		XSTR	JEDEC	2N3947
Q4	1	263-10-39470		XSTR	JEDEC	2N3947
Q5	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q6	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q7	1	263-10-39470		XSTR	JEDEC	2N3947
Q9	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q11	1	263-10-39470		XSTR	JEDEC	2N3947
Q12	1	263-10-39470		XSTR	JEDEC	2N3947
Q13	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q14	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q15	1	263-10-39470		XSTR	JEDEC	2N3947
R1	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R2	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R3	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J
R4	1	616-02-12004		RES,12 MEG 5% 1/4W	ALLEN BRAD	RC07GF126J
R5	1	608-09-90900	624	RES. 9.09K 1% 1/10W	SPEC	624
R6	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R7	1	616-02-91000		RES,9.1K 5% 1/4W	ALLEN BRAD	RC07GF912J
R8	1	608-09-00000	624	RES,*T/VAR* 1% 1/10W		
R9	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J

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ITEM NO.	QTY REQD	E M N PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R10	1	616-02-91000		RES,9.1K 5% 1/4W	ALLEN BRAD	RC07GF912J
R11	1	608-09-00000	624	RES,*T/VAR* 1% 1/10W		
R12	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R13	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R14	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J
R15	1	616-02-12004		RES,12 MEG 5% 1/4W	ALLEN BRAD	RC07GF126J
R16	1	608-09-90900	624	RES. 9.09K 1% 1/10W	SPEC	624
R17	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R18	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R19	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J
R20	1	616-02-12004		RES,12 MEG 5% 1/4W	ALLEN BRAD	RC07GF126J
R21	1	608-09-90900	624	RES. 9.09K 1% 1/10W	SPEC	624
R22	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R23	1	616-02-91000		RES,9.1K 5% 1/4W	ALLEN BRAD	RC07GF912J
R24	1	608-09-00000	624	RES,*T/VAR* 1% 1/10W		
R25	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R26	1	616-02-91000		RES,9.1K 5% 1/4W	ALLEN BRAD	RC07GF912J
R27	1	608-09-00000	624	RES,*T/VAR* 1% 1/10W		
R28	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R29	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R30	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J
R31	1	616-02-12004		RES,12 MEG 5% 1/4W	ALLEN BRAD	RC07GF126J
R32	1	608-09-90900	624	RES. 9.09K 1% 1/10W	SPEC	624
R33	1	616-02-00000		RES, *T/VAR* 5% 1/4W		

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R34	1	616-02-00000		RES, *T/VAR* 5% 1/4W		
R35	1	616-02-00000		RES, *T/VAR* 5% 1/4W		
R36	1	616-02-00000		RES, *T/VAR* 5% 1/4W		
REF1	1	905-01-00375	15797	SCHEMATIC	SPEC	15797
REF2	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

FIRST USAGE MODEL 4530

PARTS LIST 15906 REV DATE 12/07/68 REV LTR D

LIST TITLE PWA,CALIBRATE CARD NO CAL CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-89-00495 ECO 35313 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00395	15905	PWB,CALIBRATE	SPEC	15905
2	26	065-98-00012		CONT,SOCKET	AMP	85861-4
3	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	SPEC	619-22
4	A/R	268-02-00039		TUBING,#22,EXTR TEF,CLEAR	QVL	MIL-I-22129
C1	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601 (S/N 1 THRU 80)
C1	1	337-22-15004	601	CAP. 15MF 20% 20V	SPEC	601 (S/N 81 AND UP)
C2	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601 (S/N 1 THRU 80)
C2	1	337-22-15004	601	CAP. 15MF 20% 20V	SPEC	601 (S/N 81 AND UP)
R1	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R2	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
R3	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R14	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R15	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R16	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
T1	1	262-99-00064	15802	XFMR,OUTPUT	SPEC	15802 (S/N 1 THRU 148)
T1	1	262-89-00043	15802-3	XFMR, ASSY, OUTPUT	SPEC	15802-3 (S/N 149 AND UP)
T2	1	262-99-00064	15802	XFMR,OUTPUT	SPEC	15802 (S/N 1 THRU 148)
T2	1	262-89-00043	15802-3	XFMR, ASSY, OUTPUT	SPEC	15802-3 (S/N 149 AND UP)
REF1	1	905-01-00376	15800	SCHEMATIC	SPEC	15800
REF2	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

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PARTS LIST 15906-1 REV DATE 08/19/68 REV LTR D

LIST TITLE PWA,CALIBRATE CARD EXT CA CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-09-00496 ECO 34181 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-09-00395	15905	PWB,CALIBRATE	SPEC	15905
2	26	065-98-00012		CONT,SOCKET	AMP	85861-4
3	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	SPEC	619-22
4	A/R	268-02-00039		TUBING,#22,EXTR TEF,CLEAR	QVL	MIL-I-22129
C1	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601 (S/N 1 THRU 80)
C1	1	337-22-15004	601	CAP. 15MF 20% 20V	SPEC	601 (S/N 81 AND UP)
C2	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601 (S/N 1 THRU 80)
C2	1	337-22-15004	601	CAP. 15MF 20% 20V	SPEC	601 (S/N 81 AND UP)
CR1	1	088-10-41480		DIODE	JEDEC	1N4148
K1	1	219-98-00046		RELAY,2 FORM C CONTACTS	HATHAWAY INS	GP-2C-26-FCD
K3	1	219-98-00046		RELAY,2 FORM C CONTACTS	HATHAWAY INS	GP-2C-26-FCD
R1	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R2	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
R3	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R14	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R15	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R16	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
T1	1	262-99-00064	15802	XFMR,OUTPUT	SPEC	15802 (S/N 1 THRU 148)
T1	1	262-89-00043	15802-3	XFMR, ASSY, OUTPUT	SPEC	15802-3 (S/N 149 AND UP)
T2	1	262-99-00064	15802	XFMR,OUTPUT	SPEC	15802 (S/N 1 THRU 148)
T2	1	262-89-00043	15802-3	XFMR, ASSY, OUTPUT	SPEC	15802-3 (S/N 149 AND UP)
REF1	1	905-01-00378	16131	SCHEMATIC	SPEC	16131
REF2	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

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EMR - TELEMETRY

PARTS LIST 15906-2 REV DATE 08/19/68 REV LTR B

LIST TITLE PWA,CALIBRATE CARD EXT CA CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-89-00497 ECO 34181 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00395	15905	PWB,CALIBRATE	SPEC	15905
2	26	065-98-00012		CONT,SOCKET	AMP	85861-4
3	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	SPEC	619-22
4	A/R	268-02-00039		TUBING,#22,EXTR TEF,CLEAR	QVL	MIL-I-22129
CR1	1	088-10-41480		DIODE	JEDEC	1N4148
K1	1	219-98-00046		RELAY,2 FORM C CONTACTS	HATHAWAY INS	GP-2C-26-FCD
K3	1	219-98-00046		RELAY,2 FORM C CONTACTS	HATHAWAY INS	GP-2C-26-FCD
R1	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R2	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
R3	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R14	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R15	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R16	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
REF1	1	905-01-00378	16131	SCHEMATIC	SPEC	16131
REF2	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

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EMR - TELEMETRY

PARTS LIST 15906-3 REV DATE 08/19/68 REV LTR D

LIST TITLE PWA,CALIBRATE CARD INT CA CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-89-00498 ECO 34181 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00395	15905	PWB,CALIBRATE	SPEC	15905
2	26	065-98-00012		CONT,SOCKET	AMP	85861-4
3	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	SPEC	619-22
4	A/R	268-02-00039		TUBING,#22,EXTR TEF,CLEAR	QVL	MIL-I-22129
C1	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601 (S/N 1 THRU 80)
C1	1	337-22-15004	601	CAP. 15MF 20% 20V	SPEC	601 (S/N 81 AND UP)
C2	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601 (S/N 1 THRU 80)
C2	1	337-22-15004	601	CAP. 15MF 20% 20V	SPEC	601 (S/N 81 AND UP)
CR1	1	088-10-41480		DIODE	JEDEC	1N4148
CR2	1	088-10-41480		DIODE	JEDEC	1N4148
K1	1	219-98-00046		RELAY,2 FORM C CONTACTS	HATHAWAY INS	GP-2C-26-FCD
K2	1	219-98-00045		RELAY,2 FORM A CONTACTS	HATHAWAY INS	GP-2A-26-P
K3	1	219-98-00045		RELAY,2 FORM A CONTACTS	HATHAWAY INS	GP-2A-26-P
R1	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R2	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
R3	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R4	1	999-01-00002	16246	RES, *VOLT./VAR*		
R5	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R6	1	999-01-00002	16246	RES, *VOLT./VAR*		
R7	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R8	1	999-01-00001	16246	RES, *VOLT./VAR*		
R9	1	999-01-00001	16246	RES, *VOLT./VAR*		
R10	1	999-01-00002	16246	RES, *VOLT./VAR*		
R11	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066

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ITEM NO.	QTY REQD	L M K PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R12	1	999-01-00002	16246	RES, *VOLT./VAR*		
R13	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R14	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R15	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R16	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
T1	1	262-99-00064	15802	XFMR,OUTPUT	SPEC	15802 (S/N 1 THRU 148)
T1	1	262-89-00043	15802-3	XFMR, ASSY, OUTPUT	SPEC	15802-3 (S/N 149 AND UP)
T2	1	262-99-00064	15802	XFMR,OUTPUT	SPEC	15802 (S/N 1 THRU 148)
T2	1	262-89-00043	15802-3	XFMR, ASSY, OUTPUT	SPEC	15802-3 (S/N 149 AND UP)
REF1	1	905-01-00377	16130	SCHEMATIC	SPEC	16130
REF2	2	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

FIRST USAGE MODEL 4530

EMR - TELEMETRY

PARTS LIST 15906-4 REV DATE 08/19/68 REV LTR B

LIST TITLE PWA,CALIBRATE CARD INT CA CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-89-00499 ECO 34181 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00395	15905	PWB,CALIBRATE	SPEC	15905
2	26	065-98-00012		CONT,SOCKET	AMP	85861-4
3	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	SPEC	619-22
4	A/R	268-02-00039		TUBING,#22,EXTR TEF,CLEAR	QVL	MIL-I-22129
CR1	1	088-10-41480		DIODE	JEDEC	1N4148
CR2	1	088-10-41480		DIODE	JEDEC	1N4148
K1	1	219-98-00046		RELAY,2 FORM C CONTACTS	HATHAWAY INS	GP-2C-26-FCD
K2	1	219-98-00045		RELAY,2 FORM A CONTACTS	HATHAWAY INS	GP-2A-26-P
K3	1	219-98-00045		RELAY,2 FORM A CONTACTS	HATHAWAY INS	GP-2A-26-P
R1	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R2	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
R3	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R4	1	999-01-00002	16246	RES, *VOLT./VAR*		
R5	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R6	1	999-01-00002	16246	RES, *VOLT./VAR*		
R7	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R8	1	999-01-00001	16246	RES, *VOLT./VAR*		
R9	1	999-01-00001	16246	RES, *VOLT./VAR*		
R10	1	999-01-00002	16246	RES, *VOLT./VAR*		
R11	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R12	1	999-01-00002	16246	RES, *VOLT./VAR*		
R13	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R14	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R15	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R16	1	616-02-18009		RES,180 OHM 5% 1/4W	ALLEN BRAD	RC07GF181J
REF1	1	905-01-00377	16130	SCHEMATIC	SPEC	16130
REF2	2	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

FIRST USAGE MODEL 4530

EMR - TELEMETRY

PARTS LIST 15796 REV DATE 08/19/68 REV LTR G

LIST TITLE PWA,VCO CHGE CONT NO. CODE IDENT SHT 1 OF
PART NO. 205-89-00406 ECO 39528 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-89-00190	15795	PWB,VCO	SPEC	15795
2	1	239-99-00058	15733	SPACER	SPEC	15733
4	1	229-02-00066		SCREW,2-56X5/16 PAN HD	QVL	MS51957-4
5	1	273-02-00003		WASHER,#2, FLT ST STL	QVL	MS15795-802
6	3	049-98-00010		CLIP,THERMAL EQUALIZING	WAKEFIELD	259-.25
7	2	189-98-00011		PAD,XSTR TO-5 8 PIN .075	MILTON ROSS	10193-DAP
8	23	189-98-00004		PAD,XSTR TO-18 4 PIN,.15	DEL BLINN	TP-100
9	6	065-98-00012		CONT,SOCKET	AMP	85861-4
C1	1	301-13-10002		CAP., .1MF &80-20 50V LS.	ERIE	8131-050-651-104M
C2	1	304-20-20009	600	CAP. 200PF 1% 500V	SPEC	600
C3	1	301-13-10002		CAP., .1MF &80-20 50V LS.	ERIE	8131-050-651-104M
C4	1	304-13-05109	600	CAP. 51PF 1% 500V	SPEC	600
C5	1	301-13-10002		CAP., .1MF &80-20 50V LS.	ERIE	8131-050-651-104M
C6	1	337-20-39004	601	CAP., 39MF 20% 10V	SPEC	601
C7	1	997-01-00002	16247	CAP., *FREQ/VAR*		
C8	1	304-01-00509	600	CAP. 5PF .5PF 500V	SPEC	600
C9	1	305-20-20009	600	CAP. 2000PF 1% 500V	SPEC	600
C10	1	301-13-10002		CAP., .1MF &80-20 50V LS.	ERIE	8131-050-651-104M
C11	1	301-13-10002		CAP., .1MF &80-20 50V LS.	ERIE	8131-050-651-104M
C12	1	301-13-10002		CAP., .1MF &80-20 50V LS.	ERIE	8131-050-651-104M
C13	1	336-23-10003	601	CAP., 1.0MF 20% 35V	SPEC	601
C14	1	301-71-10001		CAP., .01MF -20&80% 100V	ERIE	805-000 X5VO 103Z

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
C15	1	999-01-00003	16247	CAP., *FREQ/VAR*		
C16	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601
C17	1	304-08-03009	600	CAP. 30PF .5PF 500V	SPEC	600
C18	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601
C20	1	301-03-10001		CAP., .01 MF 20% 50V		
CR1	1	088-10-41480		DIODE	JEDEC	1N4148
CR2	1	088-10-41480		DIODE	JEDEC	1N4148
CR3	1	088-99-00119	642-13	DIODE,12V,400MW	SPEC	642-13
CR4	1	088-99-00329	642-07	DIODE,6.2V,400MW	SPEC	642-07
CR5	1	088-10-41480		DIODE	JEDEC	1N4148
CR6	1	088-10-41480		DIODE	JEDEC	1N4148
CR7	1	088-99-00379	642-11	DIODE,9.1V,400MW	SPEC	642-11
CR8	1	088-10-41480		DIODE	JEDEC	1N4148
CR9	1	088-10-41480		DIODE	JEDEC	1N4148
CR11	1	088-10-41480		DIODE	JEDEC	1N4148
CR12	1	088-10-41480		DIODE	JEDEC	1N4148
CR13	1	088-10-41480		DIODE	JEDEC	1N4148
CR14	1	088-10-41480		DIODE	JEDEC	1N4148
CR15	1	088-10-41480		DIODE	JEDEC	1N4148
CR16	1	088-10-41480		DIODE	JEDEC	1N4148
CR17	1	088-10-41480		DIODE	JEDEC	1N4148
CR18	1	088-10-41480		DIODE	JEDEC	1N4148
J1	1	263-10-39470		XSTR	JEDEC	2N3947
J2	1	263-10-39470		XSTR	JEDEC	2N3947

ITEM NO.	QTY REQD	C M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
Q3	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q4	1	263-10-39470		XSTR	JEDEC	2N3947
Q5	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q6	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q7	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q8	1	263-10-39470		XSTR	JEDEC	2N3947
Q9	1	263-10-39470		XSTR	JEDEC	2N3947
Q10	1	263-10-39470		XSTR	JEDEC	2N3947
Q11	1	263-10-39470		XSTR	JEDEC	2N3947
Q12	1	263-10-39470		XSTR	JEDEC	2N3947
Q13	1	263-10-39470		XSTR	JEDEC	2N3947
Q14	1	263-10-39470		XSTR	JEDEC	2N3947
Q15	1	263-10-39470		XSTR	JEDEC	2N3947
Q16	1	263-10-39470		XSTR	JEDEC	2N3947
Q17	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q18	1	263-10-39470		XSTR	JEDEC	2N3947
Q19	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q20	1	263-10-39470		XSTR	JEDEC	2N3947
Q21	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q22	1	263-99-00139	805-1	XSTR,PNP 2N3251 SW-AMP,50	SPEC	805-1
Q23	1	263-10-39470		XSTR	JEDEC	2N3947
Q24	1	263-10-39470		XSTR	JEDEC	2N3947
R1	1	608-09-12100	624	RES. 1.21K OHM 1% 1/10W	SPEC	624
R2	1	608-09-11801	624	RES. 11.8K 1% 1/10W	SPEC	624

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R3	1	616-02-62009		RES,620 OHM 5% 1/4W	ALLEN BRAD	RC07GF621J
R4	1	201-98-00015		POT., 1K 10% 1W	AMPH. BORG	2600P-102 BS1066
R5	1	608-09-20009	624	RES, 200.0 OHM 1% 1/10W	SPEC	624
R6	1	608-09-12100	624	RES. 1.21K OHM 1% 1/10W	SPEC	624
R7	1	608-09-66500	624	RES, 6.65K 1% 1/10W	SPEC	624
R8	1	201-98-00062		POT. 200 OHM 30% 1/2W	BECK INSTR	62PR200
R9	1	608-09-34000	624	RES, 3.40K 1% 1/10W	SPEC	624
* R10	1	608-09-45309	624	RES, 453.0 OHM 1% 1/10W	SPEC	624 (S/N 1 THRU 18)
* R10	1	608-09-54909	624	RES, 549.0 OHM 1% 1/10W	SPEC	624 (S/N 19 AND UP)
R11	1	608-09-34000	624	RES, 3.40K 1% 1/10W	SPEC	624
R12	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624
R13	1	608-09-51101	624	RES, 51.1K 1% 1/10W	SPEC	624
R14	1	201-98-00152		POT., 10K 20% .75W	BECKMAN	78PR10K
R15	1	608-09-90901	624	RES, 90.9K 1% 1/10W	SPEC	624
R16	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624
R17	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624
R18	1	608-09-10000	624	RES. 1K 1% 1/10W	SPEC	624
R19	1	616-02-51002		RES,510K 5% 1/4W	ALLEN BRAD	RC07GF514J
R20	1	616-02-51002		RES,510K 5% 1/4W	ALLEN BRAD	RC07GF514J
R21	1	616-02-27009		RES,270 OHM 5% 1/4W	ALLEN BRAD	RC07GF271J
R22	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J
R23	1	616-02-33000		RES,3.3K 5% 1/4W	ALLEN BRAD	RC07GF332J
R24	1	999-01-00001	16247	RES, *DEV/VAR*		
R25	1	608-09-20000	624	RES. 2.0K 1% 1/10W	SPEC	624
R26	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624

FIRST USAGE MODEL 4530

* R10 IS A TEST VARIABLE (RANGE OF 400 TO 600 OHMS ±1%, 1/10W) ON UNIT SERIAL NUMBERS 88 AND UP.

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R27	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624
R28	1	608-09-30100	624	RES. 3.01K 1% 1/10W	SPEC	624
R29	1	608-09-45300	624	RES. 4.53K 1% 1/10W	SPEC	624
R30	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624
R31	1	616-02-39009		RES,390 OHM 5% 1/4W	ALLEN BRAD	RC07GF391J
R32	1	616-02-82009		RES,820 OHM 5% 1/4W	ALLEN BRAD	RC07GF821J
R33	1	608-09-20001	624	RES. 20K 1% 1/10W	SPEC	624
R34	1	201-98-00159		POT., 100K 20% .75W	BECKMAN	78PR100K
R35	1	608-09-40200	624	RES. 4.02K 1% 1/10W	SPEC	624
R36	1	608-09-68100	624	RES. 6.81K 1% 1/10W	SPEC	624
R37	1	201-98-00089		POT., 2K 10% 1W	AMPHENOL	2600P-202 BS1066
R38	1	608-09-28700	624	RES. 2.87K 1% 1/10W	SPEC	624
R39	1	608-09-30100	624	RES. 3.01K 1% 1/10W	SPEC	624
R40	1	608-09-88709	624	RES. 887.0 OHM 1% 1/10W	SPEC	624
R41	1	608-09-57609	624	RES. 576.0 OHM 1% 1/10W	SPEC	624
R42	1	616-02-13000		RES,1.3K 5% 1/4W	ALLEN BRAD	RC07GF132J
R43	1	616-02-56000		RES,5.6K 5% 1/4W	ALLEN BRAD	RC07GF562J
R44	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R45	1	608-09-20500	624	RES. 2.05K 1% 1/10W	SPEC	624
R46	1	608-09-20000	624	RES. 2.0K 1% 1/10W	SPEC	624
R47	1	616-02-30009		RES. 300 OHM 5% 1/4W	ALLEN BRAD	RC07GF301J
R48	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R49	1	608-09-23700	624	RES., 2.37K 1% 1/10W	SPEC	624
R50	1	616-02-12000		RES,1.2K 5% 1/4W	ALLEN BRAD	RC07GF122J

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R51	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R52	1	608-09-10001	624	RES. 10K 1% 1/10W	SPEC	624
R53	1	608-09-15000	624	RES, 1.50K 1% 1/10W	SPEC	624
R54	1	616-02-01809		RES,18 OHM 5% 1/4W	ALLEN BRAD	RC07GF180J
R55	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J
R56	1	201-98-00089		POT., 2K 10% 1W	AMPHENOL	2600P-202 BS1066
R57	1	608-09-30100	624	RES. 3.01K 1% 1/10W	SPEC	624
R58	1	616-02-01809		RES,18 OHM 5% 1/4W	ALLEN BRAD	RC07GF180J
R59	1	616-02-51000		RES,5.1K 5% 1/4W	ALLEN BRAD	RC07GF512J
R60	1	201-98-00062		POT. 200 OHM 30% 1/2W	BECK INSTR	62PR200
R61	1	608-09-00000	624	RES, *T/VAR* 1% 1/10W		
R62	1	608-09-64909	624	RES, 649.0 OHM 1% 1/10W	SPEC	624
R63	1	601-22-30000		RES,3K 3% 1W	DALE	RS-1A
R64	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R65	1	608-09-15000	624	RES, 1.50K 1% 1/10W	SPEC	624
R66	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R67	1	608-09-49900	624	RES. 4.99K 1% 1/10W	SPEC	624
R68	1	608-09-90900	624	RES. 9.09K 1% 1/10W	SPEC	624
R69	1	608-01-02499	624	RES, 24.9 OHM 1% 1/10W	SPEC	624
R70	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R71	1	201-98-00089		POT., 2K 10% 1W	AMPHENOL	2600P-202 BS1066
R72	1	608-09-90909	624	RES, 909.0 OHM 1% 1/10W	SPEC	624
R73	1	608-09-69809	624	RES, 698.0 OHM 1% 1/10W	SPEC	624
R74	1	201-98-00121		POT., 50 OHM 10% .75W PC	BECKMAN	79PR50

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R75	1	616-02-30000		RES,3K 5% 1/4W	ALLEN BRAD	RC07GF302J
R76	1	608-09-49900	624	RES. 4.99K 1% 1/10W	SPEC	624
R77	1	608-09-15000	624	RES, 1.50K 1% 1/10W	SPEC	624
R78	1	608-09-90900	624	RES. 9.09K 1% 1/10W	SPEC	624
R79	1	608-01-02499	624	RES, 24.9 OHM 1% 1/10W	SPEC	624
R80	1	608-09-10000	624	RES. 1K 1% 1/10W	SPEC	624
R81	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R82	1	616-02-91000		RES,9.1K 5% 1/4W	ALLEN BRAD	RC07GF912J
R83	1	616-02-68009		RES,680 OHM 5% 1/4W	ALLEN BRAD	RC07GF681J
R84	1	201-98-00151		POT., 2K 20% .75W	BECKMAN	78PR2K
R85	1	616-02-04709		RES,47 OHM 5% 1/4W	ALLEN BRAD	RC07GF470J
R86	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R87	1	616-02-62000		RES,6.2K 5% 1/4W	ALLEN BRAD	RC07GF622J
R88	1	616-02-22009		RES,220 OHM 5% 1/4W	ALLEN BRAD	RC07GF221J
R89	1	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J
R90	1	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J
R91	1	616-02-18001		RES,18K 5% 1/4W	ALLEN BRAD	RC07GF183J
R92	1	616-02-22009		RES,220 OHM 5% 1/4W	ALLEN BRAD	RC07GF221J
R93	1	608-09-88700	624	RES, 8.87K 1% 1/10W	SPEC	624
R95	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J
* R96	1	608-09-49909	624	RES, 499.0 OHM 1% 1/10W	SPEC	624 (S/N 1 THRU 18)
* R96	1	608-09-54909	624	RES, 549.0 OHM 1% 1/10W	SPEC	624 (S/N 19 AND UP)
Z1	1	046-18-00006		INTCKT,MA702C,DC AMPL	FCH	U5B770239X
Z2	1	046-18-00006		INTCKT,MA702C,DC AMPL	FCH	U5B770239X
REF1	1	905-01-00374	15794	SCHEMATIC	SPEC	15794

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* R96 IS A TEST VARIABLE (400 TO 600 OHMS ±1%, 1/10W) ON UNIT SERIAL NUMBERS 88 AND UP.

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
REF2	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	SPEC	9500-1

FIRST USAGE MODEL 4530

Table 6-2. Recommended Spares List

PART DESCRIPTION	EMR STOCK NO.	VENDOR NAME	VENDOR PART NO.	TQ	RS
MODEL 4530-X1					
INTEGRATED CIRCUIT, MA702C	046-18-00006	FCH	U5B770239X	4	1
DIODE	088-10-41480	JEDEC	1N4148	32	4
POTENTIOMETER, 2K ±10%, 1W	201-98-00089	Amphenol	2600P-202-BS1066	6	1
TRANSISTOR	263-10-39470	JEDEC	2N3947	38	4
TRANSISTOR	263-99-00139	Spec	805-1	22	3
CAPACITOR, 0.1 µf +80% −20%, 50V	301-14-10002	Erie	8131-050-651-104Z	12	2
CAPACITOR, 1.0 µf ±20%, 35V	336-23-10003	Spec	601	6	1
CAPACITOR, 6.8 µf ±20%, 35V	337-23-68003	Spec	601	6	1
RESISTOR, 1.50K ±1%, 1/10W	608-09-15000	Spec	624	6	1
RESISTOR, 3.01K ±1%, 1/10W	608-09-30100	Spec	624	6	1
RESISTOR, 9.09K ±1%, 1/10W	608-09-90900	Spec	624	8	1
RESISTOR, 10K ±1%, 1/10W	608-09-10001	Spec	624	14	2
RESISTOR, 510 Ω ±5%, 1/4W	616-02-51009	Allen Bradley	RC07GF511J	6	1
RESISTOR, 1K ±5%, 1/4W	616-02-10000	Allen Bradley	RC07GF102J	8	1
RESISTOR, 1.5K ±5%, 1/4W	616-02-15000	Allen Bradley	RC07GF152J	6	1
RESISTOR, 9.1K ±5%, 1/4W	616-02-91000	Allen Bradley	RC07GF912J	6	1
RESISTOR, 10K ±5%, 1/4W	616-02-10001	Allen Bradley	RC07GF103J	8	1
MODEL 4530-X2					
INTEGRATED CIRCUIT, MA702C	046-18-00006	FCH	U5B770239X	4	1
DIODE	088-10-41480	JEDEC	1N4148	33	4
POTENTIOMETER, 2K ±10%, 1W	201-98-00089	Amphenol	2600P-202-BS1066	6	1
TRANSISTOR	263-10-39470	JEDEC	2N3947	38	4
TRANSISTOR	263-99-00139	Spec	805-1	22	3
CAPACITOR, 0.1 µf +80% −20%, 50V	301-14-10002	Erie	8131-050-651-104Z	12	2
CAPACITOR, 1.0 µf ±20%, 35V	336-23-10003	Spec	601	6	1

Table 6-2 (Cont'd.). Recommended Spares List

PART DESCRIPTION	EMR STOCK NO.	VENDOR NAME	VENDOR PART NO.	TQ	RS
CAPACITOR, 6.8 μf ±20%, 35V	337-23-68003	Spec	601	6	1
RESISTOR, 1.50K ±1%, 1/10W	608-09-15000	Spec	624	6	1
RESISTOR, 3.01K ±1%, 1/10W	608-09-30100	Spec	624	6	1
RESISTOR, 9.09K ±1%, 1/10W	608-09-90900	Spec	624	8	1
RESISTOR, 10K ±1%, 1/10W	608-09-10001	Spec	624	14	2
RESISTOR, 510 Ω ±5%, 1/4W	616-02-51009	Allen Bradley	RC07GF511J	6	1
RESISTOR, 1K ±5%, 1/4W	616-02-10000	Allen Bradley	RC07GF102J	8	1
RESISTOR, 1.5K ±5%, 1/4W	616-02-15000	Allen Bradley	RC07GF152J	6	1
RESISTOR, 9.1K ±5%, 1/4W	616-02-91000	Allen Bradley	RC07GF912J	6	1
RESISTOR, 10K ±5%, 1/4W	616-02-10001	Allen Bradley	RC07GF103J	8	1
MODEL 4530-X3					
INTEGRATED CIRCUIT, MA702C	046-18-00006	FCH	U5B770239X	4	1
DIODE	088-10-41480	JEDEC	1N4148	34	4
POTENTIOMETER, 1K ±10%, 1W	201-98-00015	Amp. Borg	2600P-102-BS1066	6	1
TRANSISTOR	263-10-39470	JEDEC	2N3947	38	4
TRANSISTOR	263-99-00139	Spec	805-1	22	3
CAPACITOR, 0.1 μf +80% -20%, 50V	301-14-10002	Erie	8131-050-651-104Z	12	2
CAPACITOR, 1.0 μf ±20%, 35V	336-23-10003	Spec	601	6	1
CAPACITOR, 6.8 μf ±20%, 35V	337-23-68003	Spec	601	6	1
RESISTOR, 1.50K ±1%, 1/10W	608-09-15000	Spec	624	6	1
RESISTOR, 3.01K ±1%, 1/10W	608-09-30100	Spec	624	6	1
RESISTOR, 9.09K ±1%, 1/10W	608-09-90900	Spec	624	8	1
RESISTOR, 10K ±1%, 1/10W	608-09-10001	Spec	624	14	2
RESISTOR, 510 Ω ±5%, 1/4W	616-02-51009	Allen Bradley	RC07GF511J	6	1
RESISTOR, 1K ±5%, 1/4W	616-02-10000	Allen Bradley	RC07GF102J	8	1
RESISTOR, 1.5K ±5%, 1/4W	616-02-15000	Allen Bradley	RC07GF152J	6	1
RESISTOR, 9.1K ±5%, 1/4W	616-02-91000	Allen Bradley	RC07GF912J	6	1
RESISTOR, 10K ±5%, 1/4W	616-02-10001	Allen Bradley	RC07GF103J	8	1

Table 6-2 (Cont'd.). Recommended Spares List

PART DESCRIPTION	EMR STOCK NO.	VENDOR NAME	VENDOR PART NO.	TQ	RS
MODEL 4530-X4					
INTEGRATED CIRCUIT, MA702C	046-18-00006	FCH	U5B770239X	4	1
DIODE	088-10-41480	JEDEC	1N4148	34	4
POTENTIOMETER, 1K ±10%, 1W	201-98-00015	Amp. Borg	2600P-102-BS1066	6	1
TRANSISTOR	263-10-39470	JEDEC	2N3947	38	4
TRANSISTOR	263-99-00139	Spec	805-1	22	3
CAPACITOR, 0.1 μf +80% -20%, 50V	301-14-10002	Erie	8131-050-651-104Z	12	2
CAPACITOR, 1.0 μf ±20%, 35V	336-23-10003	Spec	601	6	1
CAPACITOR, 6.8 μf ±20%, 35V	337-23-68003	Spec	601	6	1
RESISTOR, 1.50K ±1%, 1/10W	608-09-15000	Spec	624	6	1
RESISTOR, 3.01K ±1%, 1/10W	608-09-30100	Spec	624	6	1
RESISTOR, 9.09K ±1%, 1/10W	608-09-90900	Spec	624	8	1
RESISTOR, 10K ±1%, 1/10W	608-09-10001	Spec	624	14	2
RESISTOR, 510 Ω ±5%, 1/4W	616-02-51009	Allen Bradley	RC07GF511J	6	1
RESISTOR, 1K ±5%, 1/4W	616-02-10000	Allen Bradley	RC07GF102J	8	1
RESISTOR, 1.5K ±5%, 1/4W	616-02-15000	Allen Bradley	RC07GF152J	6	1
RESISTOR, 9.1K ±5%, 1/4W	616-02-91000	Allen Bradley	RC07GF912J	6	1
RESISTOR, 10K ±5%, 1/4W	616-02-10001	Allen Bradley	RC07GF103J	8	1

Table 6-3. Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
ALCO	Alco Electronics Manufacturing Co., Lawrence, Mass.
ALLEN BRAD	Allen-Bradley Co., Milwaukee, Wis.
ALPHLEX	Alpha Wire Corp., Elizabeth, N.Y.
AMATHOM	Amathom Electronic Hdwr. Co., Inc., New Rochelle, N.Y.
AMER SEALANT	American Sealants Co., Hartford, Conn.
AMPEREX	Amperex Electronic Co., Hicksville, N.Y.
AMPH BORG	Amphenol Corp., Broadview, Ill.
AMPHENOL	Amphenol Corp., Los Gatos, Calif.
AMP INC.	Amp, Inc., Harrisburg, Pa.
BECK INSTR	Beckman Instruments, Inc., Fullerton, Calif.
BECKMAN	Beckman Instruments, Inc., Fullerton, Calif.
BIRNBACH	Birnbach Radio Co., Inc., New York, N.Y.
BURNDY	Burndy Corp., Norwalk, Conn.
CARR FAST	Carr Fastener Co., Cambridge, Mass.
CKT STRU	Circuit Structures Lab., Santa Ana, Calif.
CLAROSTAT	Clarostat Mfg. Co., Dover, N.H.
DEL BLINN	Delbert/Blinn Co., Pomona, Calif.
EECO	Engineered Electronics Co., Inc., Santa Ana, Calif.
E.F. JOHNSON	E.F. Johnson Co., Waseca, Minn.
ERIE	Erie Technological Products, Inc., Erie, Pa.
FCH	Fairchild Camera and Instrument Corp., Mountain View, Calif.
GEN CEMENT	General Cement Division of Textron, Inc., Rockford, Ill.

Table 6-3 (Cont'd.). Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
HARTWELL	Hartwell Corp., Los Angeles, Calif.
HATHAWAY INS.	Hathaway Instruments, Inc., Denver, Colorado
H. H. SMITH	Herman H. Smith, Inc., Brooklyn, N.Y.
HUBBELL	Harvey Hubbel, Inc., Bridgeport, Conn.
JEDEC	
LITTELFUSE	Littlefuse, Inc., Des Plaines, Ill.
MILTON ROSS	Milton Ross Metals Co., Southampton, Pa.
MOT	Motorola Semiconductor Products, Inc., Phoenix, Ariz.
PENDAR	Clare-Pendar, Inc., Post Falls, Idaho
QVL	Qualified Vendor List
RIEDON	Riedon Avionics, Inc., Van Nuys, Calif.
ROSS MFG	Ross Mfg., Co., Cleveland, Ohio
ROTRON MFG	Rotron Manufacturing Co., Inc., Woodstock, N.Y.
SCANBE	Scanbe Mfg. Corp., Monterey Park, Calif.
SEALECTRO	Sealectro Corp., Mamaroneck, N.Y.
SEASTROM	Seatrom Mfg. Co., Glendale, Calif.
SHAKEPROOF	Shakeproof Division of Illinois Tool Works, Inc., Elgin, Ill.
SOUTHCO	South Coast Co., Newport Beach, Calif.
SPEC (EMR)	Electro-Mechanical Research, Inc., Sarasota, Fla.
SPRAGUE	Sprague Electric Corp., Bristol, Conn.
SUPERIOR	Superior Electric Co., Bristol, Conn.
WAKEFIELD	Wakefield Engineering, Inc., Wakefield, Mass.

Table 6-4. Customer Provisioning Questionnaire

1. Equipment to be spared
   Model No.(s): _____
   Serial No.(s): _____

2. Number of equipments to be spared in each location _____

3. Operating time and cycle: _____ hours/day, _____ day/week.

4. Operating Environment:

   A. Temperature: _____
   B. Humidity: _____
   C. Altitude: _____
   D. Shock and Vibration: _____

5. Non-operating Environment: _____

   A. Temperature: _____
   B. Humidity: _____
   C. Altitude: _____

6. Desired probability of being able to spare from complement _____ percent for _____ months.

7. Can usage permit troubleshooting to parts level when a failure occurs? _____

8. What spare assemblies do you have that are used in this Model Equipment? _____

9. Do you wish us to exclude the EMR warranty period? _____

TECHNICAL MANUAL UTILITY REPORT

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